Electrical World

The consolidation of ELECTRICAL WORLD AND ENGINEER and AMERICAN ELECTRICIAN.
Published by McGraw Publishing Company, Inc.

Vol. 64 NEW YORK, SATURDAY, OCTOBER 24, 1914 No. 17

Central Stations and the Electric Vehicle

The Electric Vehicle Association convention which has just closed in Philadelphia may be regarded as marking an epoch in the industry, inasmuch as the latent hope of all those interested has been crystallized at least in one direction. It is fully realized that the one great outstanding problem is the general introduction of electric vehicles in city merchandise transportation. This problem has become an administrative one and calls for the concentration upon it of the best minds the electrical industry can command. It has been thoroughly demonstrated that of the many groups of persons interested in the general propaganda the central stations will receive the most benefit. The problem of quantity introduction, therefore, becomes the duty of the central station rather than the hope of the manufacturer. The determination reached during the convention that this responsibility would be recognized and acted upon by those in charge of central-station properties, with due regard to the magnitude of advantages likely to result to them, is a most gratifying accomplishment. This has been a latent purpose among the manufacturers for many years, and they have striven long and earnestly to bring it to practical realization. Consequently, if this one result of the Philadelphia convention were the only accomplishment, those associated in this organization would have good reason to feel much gratified.

Politics and Monopoly

President Wilson reserved his comment on the new trust legislation for his political letter to Representative Underwood. When he omitted to talk about the legislation at the time of affixing his signature it appeared to be a reversal of a practice that he has usually followed. The country has learned to expect his views upon legislation in which he is personally interested and in general has not objected to his way of making them public. There may be some difference of opinion concerning the departure seen in his discussion of the legislation for what is obviously a campaign document, but that is, after all, purely incidental to the real opinion of the Executive on this vital subject. Industry cannot easily forget the warmly outspoken words of reassurance with which the President announced his trust legislation program. It may be that "monopoly," the man of straw, was created for the purpose that it has now served in being defied, attacked and worsted by the heroic efforts of Congress. If that is all that the letter of the President means, business will not begrudge any credit that a political party asks or claims for what it has accomplished. What is really important is that the trust legislation shall be accepted as completed; that Congress, having had its way, shall be content and leave business alone and free to prosper if it can, and that business shall be out of politics.

Anniversary of Incandescent Lamp

October 21 is a significant day for the electric-lighting industry, in that it marks the anniversary of the invention of the incandescent lamp by Edison. It is fitting, therefore, that the day should be had in remembrance by the central stations of the country, difficult though it may be to grace it with suitable ceremony. However, no celebration of the electric-lighting industry can suffice to do honor to the genius of Edison. His is a grander, nobler and more transcendent glory. He belongs not to the electrical industry but to the world. Kings with their armies have done less to advance civilization than he. The whole universe owes him a debt such as no other living mortal can claim. Great as is the incandescent lamp, greater still, in the estimation of many, are the phonograph and motion picture. One were enough to put us all in his debt. Let us not forget, we who honor our military heroes, that there are men more deserving of immortalization than they—men who have won recognition not in war but on the battlefield of life, whose energies have been devoted to the uplift and comfort of their fellow-men. There is a mighty host of these silent heroes in the world, and leading them all is Edison.

Maintaining the Record

For many years electric central stations have had deep pride in their inherent ability to withstand the effect of adverse conditions in general business. They have justly proclaimed to the world the reasons for their superior position. As a result of their power in this respect they have been able to obtain better terms for securities from bankers and investors. When money had to be borrowed the reputation which they have built up has been worth actual dollars in lower interest rates and higher prices of securities. The reputation which made such highly desirable savings possible is the real product of the good earnings which electrical utilities have fortunately been privileged to exhibit. It was not built up in a day; it is the result of characteristics which have marked the industry from the early days. Countless times in years past the companies have shown their happy freedom from vicissitudes which have fallen upon business generally. As

time goes on their service has become more necessary, and the great and undiminished growth of new business from year to year has overcome occasional reductions in the demand from established customers. So it has been that alike in what the financial world calls good and in what it calls bad years electrical utilities have made satisfactory records. In the present financial disturbance all of the indications still go to show that the companies are true to history. If their earnings are held well, operators may be sure that the problem of raising new capital will be solved. How long it will take the banks to restore financial equilibrium in the large centers no one can tell. Except in the South, which is still depressed by the cotton situation, there are many smaller centers throughout the country where capital is abundant and untimid. The company at Sedalia, Mo., is trying the novel plan of offering locally $25,000 of one-year 6 per cent notes in one-hundred-dollar denomination, secured by a deposit of first mortgage bonds. Either through local capital or funds secured from the banking centers the companies will find that their wants will be supplied in time. The burden of maintaining the record untarnished rests in part on the new-business department, whose work in such times as these exerts an incalculable effect on the future of the property.

Electromagnet as Standard of Field Strength

In a great variety of electromagnetic measurements a magnetic field of known intensity must be produced. In some cases it suffices to be able to produce this intensity at a given point. In other cases it has to be produced throughout a certain circumscribed region. Instruments of the Weston-D'Arsonval type carry about within them a substantially constant magnetic field in the narrow air-gap or air-gaps of a permanent-magnet circuit. In the shunt-wound dynamo machine a fair approximation to a uniform total useful flux is ordinarily attained. In the compound-wound machine, especially that provided with compensating field poles, the degree of approximation is yet higher.

A special form of compensated electromagnet, suitable for maintaining a substantially constant flux density in a fairly wide air-gap, has recently been described by Dr. R. Beattie in the London *Electrician*, as alluded to in our Digest. The electromagnet is provided with two magnetic circuits, one of which is nearly saturated, while the other remains of nearly constant reluctance. By opposing mmfs in these magnetic circuits the flux produced by the exciting current through the main coil rises but slowly with rise of current, owing to the influence of saturation, whereas the flux produced by the same exciting current through the auxiliary coils follows a nearly straight-line law. The merging of these two opposed fluxes in the air-gap common to both keeps the resultant practically constant over a fairly wide range of exciting current. If the apparatus were employed with a shunt winding connected to ordinary direct-current lighting mains, the flux in the gap should remain practically constant over any range of temperature, or of voltage variation, likely to be encountered practically.

A compensated magnetic field of the above type should also be capable of being used as a source of relatively feeble low-frequency sinusoidal emf for testing purposes by rotating a small coil at measured speeds within the gap. After the field intensity had once been measured by way of calibration, the little generator could be left connected all day long to the exciting mains and the magnitude as well as the emf of the generated voltage determined from the speed of rotation given to the rotor coil. In the permanent-magnet type of portable magnetic field the gap is necessarily so narrow that there is room only for the passage of a small coil to and fro, but with a stationary and more powerful electromagnet the air-gap with its steady magnetic field might become sufficiently enlarged to admit of spinning a small coil within it. It is remarkable how limited are our laboratory means for maintaining constant flux density. We ought to possess means for maintaining a fairly strong field throughout an appreciable region for laboratory purposes.

The Bishop Creek Plant

The hydroelectric installation of the Southern Sierras Power Company, an account of which by Mr. C. O. Poole is now appearing in our columns, had its beginning about ten years ago in furnishing energy to the Nevada mining district around Goldfield. As need for electric energy in California became greater and the possibilities of the Bishop Creek location were more fully appreciated, a plan for extension was formulated and the long line connecting Bishop Creek with the San Bernardino country was built and put into service. This line stretches over nearly 240 miles practically straight-away and is joined at each end to another transmission system, the northern one running northeast into Nevada, the southern one down to and across the Mexican line, making a total stretch from the power station of about 400 miles. The whole group of generating stations along the Bishop Creek watershed on the eastern slope of the Sierra Nevadas cover a distance of about 15 miles, with three capacious reservoir sites. They comprise in all seven stations, of which five are now in operation, forming a remarkable example of the complete utilization of a stream. The storage reservoirs are natural lakes ground out by glacial action.

The original station, operated under 1100 ft. head, contains two 750-kw and three 1500-kw generators driven by Pelton wheels. This plant was first installed in 1905, and since then the four others, descriptions of which are contained in our articles, have been added, and two more will be installed later. The first plant had 118 miles of transmission line to Goldfield and Tonopah, operating at 55,000 volts, while the longer line southward is designed for 140,000 volts. The present section of the article by Mr. Poole deals particularly with the most interesting and delicate hydraulic work done in extending the series of plants.

Perhaps the most striking engineering feat performed was tapping the south lake reservoir from 600 ft. below the site of the dam, driving a tunnel into the solid granite, coming up to the lake, and breaking through the lake bottom to convert the tunnel into a pressure pipe. The end of the tunnel being 65 ft. under water, the task of cutting through involved some rather unusual work. It was actually accomplished by excavating very cautiously within about 20 ft. of the lake bottom and then cutting short laterals to provide a powder chamber for blowing up the bottom and admitting the water. The tunnel was tamped for 30 ft. with muck back of the powder, and when the 5200-lb. charge was fired the end of the tunnel was blown out into the lake. This, one of the many formidable engineering problems solved in the construction of the Bishop Creek plants, is an excellent example of the resourcefulness of the engineer brought out by facing the difficulties of such construction. Our readers will follow with interest the story of the development of this great enterprise, which involves as much of originality and thoroughness in engineering work as any hydroelectric system with which we are acquainted. It is a splendid addition to the already distinguished list of great enterprises which make the Pacific Coast preeminent in the work of energy transmission.

The Need of the Railroads

The rehearing of the freight-rate-advance case by the Interstate Commerce Commission, which began this week, is the outgrowth of the plain necessities which the war put upon carriers. The commission said in effect on July 29 that the roads were not in need of more revenue so seriously as to make the desired advance in freight rates necessary; the meaning of this is that the roads were earning what they were entitled to earn, not substantially either more or less than that. If the roads, under the conditions then existing and reasonably to be anticipated, were earning a fair return, they are not now earning a return corresponding to the altered state of the money market. To be successful in the vital object of attracting continual new capital investment, the rate of return allowed to a public utility must approximate the going rate for money. Great destruction of capital has a lasting effect on money rates. Future higher money rates are as logically a consideration for the commission in freight rate-making as the volume of traffic. All of the signs show that, irrespective of fluctuations in revenue, the cost of capital for long-term and short-term borrowers of all classes will be higher. That will be one of the prices that this country will pay for war.

The reason why companies conducting a public business should be dealt with more generously than private industries at such times is that, under the theory of regulation, they are restricted in profit to a reasonable return. Unlike private industry, they may not greatly increase their rate of return in good times. If the commission keeps them from increasing the rate of return in normal times, why is it not logical for it to keep them from decreasing their return in abnormal times? If the rule is worked to hold the roads rigidly from raising, why should it not be operated to save them from calamitous lowering? The doctrine which regulative theorists raise is peculiar. It is assumed by them that a reasonable return is consistent with good public policy and that any departure from that limit in the direction of a higher return is dangerous to the general welfare. Yet when earnings or untoward conditions threaten to make the return perilously low some one argues that general trade should not be made to pay more in order that the railroad may be protected in its position. This argument is specious, because when general trade was active and prosperous it had the benefit of the lowest living rates that the railroad could give. The situation of the carriers is one of the gravest arising from the European war, and its relief and disposition demand high and constructive statesmanship from the commission.

Exchange and Sales for Latin America

The committee on Latin-American trade appointed by Secretary of Commerce Redfield recommends as of chief importance the establishment of a dollar exchange and the perfection of our selling machinery. Although the cautionary words in which the committee restrains over-enthusiasm need emphasis, the main interest in the report, an abstract of which is published elsewhere in this issue, centers in the constructive recommendations. The belief of the committee that the present disorganization of the trade of the United States with Latin America may best be remedied and placed on a permanent satisfactory basis by the adoption of these recommendations is not an academic conclusion but the experienced judgment of business men who know conditions. It is not alone the present emergency which makes the establishment of a direct exchange in dollars desirable. The committee cites the fact that four times in twenty-five years, with a great disturbance of the world's finances, American exporters and importers in South American trade have been injured because of their dependence on London. Whether or not this country in time shall actually substitute exchange in dollars for sterling credits or shall use the new facility merely to supplement the old is of less importance than the necessity that it shall be in a position to act independently if in the future it shall desire so to do. The conservatism with which the committee meets the question of investments is representative of the present attitude of this country toward the unknown opportunities south of us. The statement that "such investments, if judiciously made, would yield an ultimate fair return" is not the promoter's way of attracting capital to unfamiliar risks, but it begets confidence, and the further statement that they "would meanwhile provide a market for American materials which cannot now be sold" is an invitation to manufacturing companies which, either directly or through subsidiaries or friendly banks, can do this financing.

The News of the Week

**Activities and Events in the Electrical Field—
Reports of Meetings—Commission Findings, Etc.**

Federal and State Jurisdiction of Water-Powers

The National Association of Attorneys-General of the United States held its eighth annual convention in Washington on Oct. 17 to 21. Attorney-General Scott Wilson of Maine presented a paper on "Federal and State Jurisdiction of Water-Powers," in which he said that where state and federal interests join there should be confidence and joint action and not jealousy of rights or powers. The present bills before Congress to some degree indicate that the federal authorities appreciate this and are disposed to leave all local matters to the several states where possible. The question of state jurisdiction over water-powers, outside of taxation and the regulation of rates of hydroelectric public utilities, is not a wide field, because there well-recognized private rights are met.

Appreciating the value of this natural resource and the fact that Maine has more undeveloped water-power than all the other New England States together, and the possibilities of long-distance transmission of electrical energy, the Legislature of Maine has declared that it is opposed to the transmission of electrical energy generated by its water-powers out of the State, and the people of the State, Mr. Wilson said, would undoubtedly approve any act that would compel users of the electrical energy developed from her water-powers to locate within the State.

Injunction Restrains Municipal Plant in Orrville, Ohio

The Court of Appeals at Wooster, Ohio, has issued a permanent injunction restraining the village of Orrville and its officials from selling bonds to raise money or spending money for an electric-light plant or completing a plant already begun. The village may carry the case to the Supreme Court. The Massillon Electric & Gas Company constructed a line to Orrville at a cost of $30,000 and secured many customers for energy, but the Village Council then called an election to vote on the issue of bonds for a municipal plant. A suit for an injunction to restrain this step was begun in March by the company. The Common Pleas Court refused to grant an injunction, but the company carried the case to the Court of Appeals.

Pennsylvania Engineers Disapprove Registration

The Pennsylvania Legislature last winter authorized the appointment of a commission to look into the advisability of the registration of engineers. Mr. F. Herbert Snow, Harrisburg, is chairman of the commission, which has held hearings in Pittsburgh, on Oct. 15 and 16, and in Philadelphia on Oct. 19. A final hearing is to be held in Harrisburg on Oct. 28. In order to insure discussion the commission prepared a bill based on that drawn up by members of five national engineering societies. The bill was not recommended for passage but was offered merely to stimulate discussion and to get the views of engineers.

At the hearing in Pittsburgh there were only three or four advocates of registration, the general sentiment being strongly opposed not only to the bill offered but to any licensing bill. At Philadelphia the experience was similar; only one engineer spoke in favor of registration. Previous to the Philadelphia hearing the Philadelphia Association of Members of the American Society of Civil Engineers discussed the matter, and it was represented before the commission by a committee, which presented a report giving the arguments of the association against any form of registration of licensing. Dr. Edgar Marburg, professor of civil engineering, University of Pennsylvania, was chairman of this committee.

The commission expects to present a preliminary report to the Governor about Nov. 1, and a final report at the end of this year.

Annual Meeting of American Gas Institute

The ninth annual meeting of the American Gas Institute was held at the Engineering Societies Building, New York, on Oct. 21 to 23. Following the general institute meeting sessions of the manufacturing, distribution, chemical, accounting and illumination sections were held. The final session was a meeting of the entire institute. Among the papers on the program were "In Rate Fixing by Commission Should Depreciation Be Deducted from Plant Valuation?" by Dr. A. C. Humphreys, and "Accounting for Depreciation," by Mr. Halford Erickson. The committee on rates, of which Dr. William McClellan was chairman, also made a report. The other committees submitted reports, and a banquet was scheduled for the evening of Oct. 22.

Convention of Railway Electrical Engineers at Chicago

The seventh annual convention of the Association of Railway Electrical Engineers will be held at the Hotel La Salle, Chicago, Oct. 26 to 30. During the term of the sessions the nineteenth floor of the hotel will be given over to exhibits of electrical manufacturers and supply dealers making a specialty of equipment for car-lighting and railroad service.

Following a reception on Monday evening, Oct. 26, the technical program of the convention will open Tuesday morning, Oct. 27, with an address by the president, Mr. C. R. Gilman, illuminating engineer of the Chicago, Milwaukee & St. Paul Railway, to be followed by the report of Secretary Joseph A. Andreucetti, Chicago & Northwestern Railway, Chicago. At the afternoon session reports will be submitted by the committees on loose-leaf binders for filing specifications and to keep specifications and standards to date, Mr. J. R. Sloan, chairman; on reciprocal relations, Mr. L. S. Billau, chairman; on specifications for wire crossings for potentials above 100 volts, Mr. J. R. Sloan, chairman, and on data and information, Mr. Edward Wray, chairman.

On Wednesday at the morning session reports will be submitted by the committees on standards, Mr. D.

J. Cartwright, chairman, and on headlamps, Mr. C. R. Sugg, chairman, followed by a paper entitled "Communication to and Between Trains by Telegraph-Wireless, Telephone-Wireless and Telephone," by Dr. F. H. Milner, Union Pacific Railway, Omaha, Neb. At the afternoon session reports will be submitted by the committees on industrial trucks, Mr. T. V. Buckwalter, chairman; on electric traction, Mr. H. M. Van Gelder, chairman, and on specifications, Mr. W. A. Del Mar, chairman.

On Thursday at the morning session there will be reports from the committees on axle equipment, Mr. H. R. Bucks, chairman; on head-end equipment, Mr. K. R. Hare, chairman, and on standard rules for car wiring, Mr. S. W. Everett, chairman. At the afternoon session the committee reports on outside construction and yard lighting, Mr. H. M. Warren, chairman; on illumination, Mr. L. S. Billau, chairman, and on shop practice, Mr. G. W. Cravens, chairman, will be presented.

On Friday at the morning session a report is scheduled from the committee on yard facilities for charging, Mr. D. B. Pastorius, chairman, to be followed by the election of officers. The convention will close with a dinner-dance on Friday evening, tendered the members by the Railway Electrical Supply Manufacturers' Association.

Mr. Taft on New Trust Legislation

Ex-President Taft discussed the new trust legislation in his address as president of the American Bar Association at Washington on Oct. 20. He said that the first part of this legislation adds new machinery for the enforcement of the anti-trust acts. Second, it appears to create new offenses in that field of the law. Third, it imposes, after two years, certain restrictions upon what have been called interlocking directorates in banks and railroads, evidently with a view to prevent temptation to a suppression of competition and to monopoly. Fourth, it brings into the federal criminal jurisdiction embezzlements and other breaches of trust by directors, officers and agents of interstate carriers, and provides other restrictions to secure their fidelity.

It is hard to reach any other conclusion, after consideration of the old legislation and the new, than that unfair competition only includes those methods and practices in interstate trade the effect and intent of which would bring them within the scope and condemnation of the second and third sections of the Sherman act. The same thing is true of several specific offenses denounced in the Clayton act. The words "with the effect substantially to lessen competition" are to be construed in the light of their association with the words that follow them in order to secure some guide to the meaning of "substantially." It is possible to point out specific decisions of the Supreme Court on the anti-trust law in which just such acts as are here denounced are held to be within the Sherman law. The so-called tying provision in the sale of patented articles, as to which the Supreme Court divided, may be an exception. But with this exception, so far as Mr. Taft can see, the field of illegal and criminal effort in respect to restraints of interstate commerce or monopolies of it is not enlarged under the new acts.

The analogy between the functions of the Interstate Commerce Commission and the Federal Trade Commission is not complete. The consideration of the question of unreasonableness and undue discrimination as to rates would seem to vest in the commerce commission a much wider discretion and range of judgment, free from examination and review by the courts, than the trade commission has in finding the facts and making the restraining order as to "unfair competition." The trade commission is merely to apply the law to the facts as a master in chancery would do.

While Mr. Taft declared that it was not germane to his purpose to discuss the effect of the prohibition of interlocking directorates and the denunciation as federal crimes of breaches of trust by those having control of interstate commerce carriers, he said that the inconvenience they may cause to law-abiding business men of scrupulous honesty will be much more than offset by the substantial good they will do in protection of the public from illegal combinations and in the protection of confiding stockholders from being plundered.

A large part of the address was devoted to the labor feature of the legislation. The great political power that labor combinations are believed to exercise has enabled them successfully, Mr. Taft said, to press upon legislatures the idea that they are politically a privileged class, that the interest of the community lies in making them so, and that their cause is so important that the ordinary means of enforcing the law against their violations of it should be weakened rather than strengthened. To yield to this view is unwise. Between the machinations of the lawless manipulator of capital and the aggressions of the lawless leader or agents of combined labor there is a forgotten man, sometimes described as the "public," for whom government and society chiefly exist, who in the clashes between capital and labor finds himself ground between the upper and the nether millstone.

The changes from existing law which the labor provisions make are not at all radical and most of them are declaratory merely of what would be law without the statute. This is a useful statute in definitely regulating procedure in injunctions and in express definition of what may be done in labor disputes. But what Mr. Taft fears is that when the statute is construed by the courts it will keep the promise of the labor leaders to the ear, and break it to the hope, of the ranks of labor. This will be an additional reason for blaming and attacking the courts. It is really a shifting of responsibility from Congress to the judicial branch of the government that has had to bear so many of such burdens, conceived in political timidity of legislators. However this may be, Mr. Taft added that we should be profoundly grateful that the impairment of the authority of our federal courts has been but small when compared with the very drastic and dangerous changes which were pressed and proclaimed as certain.

Meeting of Patent Section of American Bar Association

The section of patent, trade-mark and copyright law of the American Bar Association met in Washington on Oct. 20, in connection with the annual convention of the association. Mr. Robert H. Parkinson, of Illinois, chairman of the section, presided. Addresses were made by Mr. Parkinson and by Patent Commissioner Ewing. Mr. Edmund Wetmore, of New York, who was to have presented a paper on "Some Aspects of the Patent Law," was unable to be present, and sent notes, which were read for him.

Mr. Parkinson said there is one modification of the patent laws which he thinks should be seriously considered and which he favors.

"We extend," he said, "to citizens of other countries privileges greatly in excess of those we receive in return. They obtain here an exclusive grant of seventeen years, for which they pay our government in the aggregate $35. They are free to import throughout that term and are not required to manufacture or provide for manufacture here. When we seek a patent

elsewhere its longest possible term is, in the principal foreign countries, fourteen or fifteen years. The government fees exacted for these shorter terms are many times what is paid here for the longer terms and the patents become forfeited if we import into such countries the patented article after a brief period, or if we fail to work the invention there. What we confer and what we receive are very unequal. The interpretation of commerce incident to the present war thrusts upon our attention the inconveniences which may result from our omission to impose upon patents granted to aliens similar conditions of forfeiture to those imposed upon us by the laws of other countries. But any general system of compulsory license I consider wholly objectionable. Such a system would not merely deprive the franchise of most of its value and destroy inducement to make and introduce invention—it would exact such expense for determining and adjudging the terms upon which each franchise shall be apportioned as neither inventors nor most assignees of patents can afford."

Mr. Wetmore said that one remedy to relieve the delay in patent causes to a sensible degree would be the creation of one division of the equity courts for the hearing of patent causes exclusively. The practical obstacle would be the difficulty of increasing the number of judges required in some, but by no means all, of the districts. Mr. Wetmore continued:

"Another cause of complaint as to the operation of our patent laws is based on the danger believed to arise from the collection of a large number of patents under the same ownership, particularly in the case of corporations, and the fixing of the prices at which patented articles may be sold in passing from the hands of the first buyer, and in making use of the patented monopoly to impose unreasonable restrictions on trade, as in the case of refusing to sell any goods, though not covered by the patent, to those who refuse to buy the patented article or to recognize the patent. It is against these things that hostile legislation has been chiefly and almost exclusively directed. It may all be classed under the head of legislation the violation of which would support a prosecution under the Sherman law. It will be freely admitted that the provisions of the Sherman law may be applied to the way in which the ownership of a patent may be exercised, as well as the ownership of any other franchise, but in the case of patents the extremest care should be exercised that the proper scope of the limited monopoly which our law intended for the protection of inventors shall not be abridged."

Industrial Safety Congress at Chicago

Safety topics in connection with transportation, public service and manufacturing occupied the Thursday afternoon session of the third annual congress of the National Council for Industrial Safety, held at the Hotel LaSalle, Chicago, Oct. 13 to 15. Mr. Martin J. Insull, vice-president of the Middle West Utilities Company, Chicago, acted as chairman of the public-service session and delivered an address on "Safety as a Means of Bettering the Relations Between the Public and Public-Service Corporations." Mr. Melville W. Mix, president of the Dodge Manufacturing Company, Mishawaka, Ind., spoke on "Safety as an Investment"; Mr. Ferd. C. Schwedtman referred to the National Conference on Safety and Sanitation, and Mr. M. W. Alexander, of the General Electric Company, West Lynn, Mass., told of the advantages gained through the co-operation of varied interests in the national conference. At the annual banquet on Thursday evening Mr. W. H. Merrill, Underwriters' Laboratories, Chicago, spoke on the topic of "Service."

ELECTRIC-VEHICLE CONVENTION

The Progress of the Electric Vehicle and the Opportunities of the Cheap Electric Car Discussed

The fifth annual convention of the Electric Vehicle Association of America was held in the Bellevue-Stratford Hotel, Philadelphia, Oct. 19, 20 and 21, with a total registration of 443. A number of excellent papers were read and they elicited many interesting discussions. The assembly was markedly enthusiastic and a spirit of optimism, which seemed to be promulgated by a message of felicitation from President Woodrow Wilson, by Mayor Blankenburg of Philadelphia in his welcoming address, and by Mr. F. W. Smith of the association in his presidential address, pervaded the whole conference.

President Wilson's Message

Soon after the first session began, on Monday morning, Mr. E. S. Marlow, of the Potomac Light & Power Company of Washington, D. C., presented to the chairman a message which he personally brought from Washington to Philadelphia in an electric automobile from President Wilson. "It is a pleasure," the President said, "to extend my greeting and best wishes to the members of the Electric Vehicle Association of America and to express my earnest wish that their industry and all those which are connected or associated with it may prosper. It is my sincere hope that the business men of America may find for themselves and for their employees in the coming months that reward for every legitimate and intelligent endeavor which they seek and which through their skill and energy they deserve."

President Smith's Address

In his address Mr. F. W. Smith, the retiring president of the association, directed attention to the wonderful growth of the society and to its increasing prestige. The possibilities awaiting the American manufacturer in foreign countries, and particularly in South America, Mr. Smith remarked, are most encouraging. In view of general conditions, he continued, the output of electric vehicles during the past year may be said to be satisfactory. Unfortunately authentic figures are not available to indicate the exact number of electric vehicles in use. Mr. Smith also referred to the low-priced electric passenger car, which has interested so many of late, declaring that the one certain solution of the problem of introducing and successfully marketing such a vehicle is quantity output.

Report of Committee on Garages and Rates

In the report of the committee on garages and rates it was implied that the association could best be served by collecting and compiling data on the facilities offered for charging electric-vehicles outside the larger centers of population. For this reason the development of a route plan was followed and it was decided to collect information regarding charging facilities along the Lincoln highway first.

Mr. G. H. Kelly, in the discussion following the reading of this report, asserted that the drawback of choosing the route plan is that the public is liable to form the erroneous opinion that the electric passenger vehicle is a touring car, and that therefore the value of publicity obtained in such a way was questionable.

Mr. E. S. Mansfield stated that the committee was looking ahead and had in consideration the possibility of the electric car at some future time becoming suitable for touring purposes.

Parcel-Post Delivery

The committee on parcel-post delivery, through its chairman, Mr. James H. McGraw, stated that the electric

vehicle has not received from the postal authorities the consideration that it deserves. Considerable effort has been made to bring the merits of the electric vehicle for such service to the attention of the authorities at Washington, and in this work the committee has co-operated with a committee from the National Electric Light Association.

The paper was discussed by Messrs. W. P. Kennedy and P. D. Wagoner, the former asking central stations and manufacturers to co-operate to obtain consideration for the electric vehicle in thirty cities where mail-carrying contracts are about to expire and the latter telling of conditions in New York, where fifty electric trucks are now used in mail service.

We append herewith abstracts of some of the most important papers presented, reserving the others for publication in a subsequent issue.

Stimulating Progress of Electric Vehicles

Mr. James H. McGraw, in a paper entitled "Stimulating Electric-Vehicle Progress," advanced three causes for the retardation of the electric-vehicle industry—first, the novel character of the business; second, the inability of those responsible for the administrative conduct of the business to open new fields; third, the defective collaboration of central-station companies. It is essential, Mr. McGraw stated, to secure for the electric vehicle of either the passenger or commercial type a consideration on utilitarian grounds. The total annual rail tonnage in this country is over a billion and a half, and it is safe to assume that at least one-third of the material transported finally reaches the principal cities and is carted at least twice over a distance of one mile. If electric vehicles were used to transport this tonnage, the electric load available to central stations would be enormous. Assuming that the freight was handled only once for 1,000,000,000 ton-miles at an average energy consumption of 5 kw-hr. per ton-mile, the gross income from energy at a 4-cent rate would be $200,000,000 per annum. What the situation really needs, Mr. McGraw declared, is a much more serious recognition of the business features of the entire project.

Discussion

President Smith remarked in opening the discussion of Mr. McGraw's paper that the author not only pointed out the way, but also suggested a plan of action which in the case of the central station will encourage thought in the development of a greater electric-vehicle load.

Mr. G. H. Kelly declared that there is a dearth of knowledge regarding the performance of electric vehicles. The electric vehicle will come into its own more quickly, he asserted, if its possibilities are advertised from one end of the country to the other. To accomplish this the central stations must co-operate and share the expense of advertising. This burden for the manufacturers alone would be too heavy.

Mr. W. P. Kennedy stated that the average price paid for an electric vehicle is $2,600 and the average income of the central stations for electricity to charge it is 10 per cent of the initial cost, or $260 per annum a vehicle. In ten years, therefore, the central stations' income for that car would be equal to its initial cost.

Disseminating Electric-Vehicle Information

In his paper entitled "A Wider Dissemination of Electric-Vehicle Information," Mr. T. I. Jones declared that the best way of advertising the electric vehicle is by word of mouth. The manufacturers are accomplishing a good work, but difficulty has been had in persuading them to demonstrate their cars. Mr. Jones avowed that in Brooklyn much success has been obtained by following up letters of inquiry by personal calls. Many central-station men consider the electric pleasure car too expensive. Of the automobiles registered up to July 1, 1914, Mr. Jones stated that the invidual cost of 70 per cent of the gasoline cars was less than $2,000, while the cost of 85 per cent of the electric cars was in excess of that amount. What the central stations need and will order in large quantities is a cheap electric car. In regard to the battery equipment, Mr. Jones declared that there has not been sufficient research in the chemistry of the batteries, the research heretofore being directed chiefly to the mechanical details. The motor is at present the best part of electric vehicles, and good developments have been made in tires. There has been some complaint regarding high rates for charging, but this, Mr. Jones held, is exaggerated, as all large companies have rates ranging from 4 cents to 5 cents for small consumption and lower rates still for garages.

Discussion

Quite an animated discussion followed. Mr. G. H. Kelly stated that demonstrations have proved to be costly and that it is not good business to demonstrate a car. If in earnest, a prospective customer will buy without a demonstration, he said.

Mr. F. A. Whitten stated that in 1912 about 300 demonstrations were given by his company and that 91 per cent of the prospective customers did not buy. Later it was decided to give a demonstration provided the applicant was willing to pay for it. On this basis there were eighty demonstrations and 90 per cent of the prospective customers bought cars. Lately all demonstrations have been abandoned.

Mr. S. G. Thompson suggested that instead of boosting a low-priced car which is not now on the market the higher-priced car of the present which is in successful use should be given every consideration. At present sales suffer in anticipation of a cheaper car.

Mr. W. H. Blood, Jr., told of his experience in building two electric vehicles a number of years ago for $1,200. With improved facilities he saw no reason why a low-priced car could not be produced.

Cost of Electric Vehicles

Mr. Kelly, in his paper entitled "The Cost of Electric Vehicles," asserted that pleasure cars sold at prices ranging from $1,800 to $2,000 have never been a success. On account of the many different models, the relatively small production and the fluctuation in demand from month to month it is difficult to build good, reliable, low-priced cars. The tendency is toward a luxurious, sturdy, long-mileage electric automobile, because the public demands such a car, and this is necessarily high-priced. In order to create a demand for electric cars, which would, of course, result in a reduction of price, it is essential, Mr. Kelly stated, to inaugurate an extensive advertising campaign. No one manufacturer, however, nor indeed all the manufacturers combined, could very well finance such a movement. It is necessary, Mr. Kelly averred, that all those interested in the electric-vehicle business co-operate. The one sure way to reduce the price, he declared, is to increase the volume; volume depends upon what the public knows of the electric vehicle and what it will accomplish; knowledge depends in its turn upon education, and education is best accomplished by advertising. A great advertising movement, which would make itself felt throughout the country and place the many advantages of the electric vehicle clearly before the people in a way comparable to that of gasoline-car advertising, would do more than any one thing to reduce the price of electric cars.

Discussion

Mr. F. W. Smith declared that it should be the policy of the central station to curtail the "joy-riding" ten-

dencies of its employees by installing electric vehicles. Central-station men who handle energy-consuming devices ought to use electric cars.

Mr. J. H. McGraw stated that the manufacturer is entitled to a large share of the credit for the successful development of the electric vehicle. It is not the fault of the manufacturer that the low-priced car has not yet become a success. He agreed with Mr. Smith that it is the duty of the central-station people to do all in their power to counteract the "joy-riding" tendency.

Mr. F. A. Whitten remarked that many salesmen in his company who were at first prejudiced against the electric car were subsequently converted to its use in preference to the gasoline car as a result of proper education.

Election of Officers

The following officers were elected for the year beginning Nov. 1: President, Mr. John F. Gilchrist, of the Commonwealth Edison Company, Chicago; vice-president, Mr. Walter H. Johnson, of the Philadelphia Electric Company; treasurer, Mr. H. M. Edwards, of the New York Edison Company; incoming directors, Mr. F. W. Smith of New York, Mr. Charles Blizard of Philadelphia, Mr. E. P. Chalfant of Chicago, and Mr. J. H. McGraw of New York.

PRESIDENT-ELECT J. F. GILCHRIST

Mr. John Foster Gilchrist, the newly elected president of the association, has made the electric-service industry his lifework and has won his spurs on merit. He is vice-president of the Commonwealth Edison Company of Chicago and a past-president of the National Electric Light Association. Mr. Gilchrist was born in Chicago, March 14, 1868, and throughout his entire business career has been connected with the Commonwealth company and its predecessor, the Chicago Edison Company. He obtained his secondary education in the Chicago high school and later in the law department of the Lake Forest University. He entered the service of the Chicago Edison Company as an office boy in 1887 and has been connected continuously with the company from that time until now, working up to his present responsible position by his own ability, resourcefulness and energy. From 1894 to 1896 he was assistant to the manager of electrical sales and in the year last mentioned was made contract agent. His record in this capacity was such as to warrant his promotion to be assistant to the president in 1906, and early this year Mr. Gilchrist was elected vice-president of the company.

THE ANNUAL JOVIAN CONGRESS

Enthusiastic Meeting at St. Louis, with Talks by Representative Contractors, Manufacturers, Jobbers and Central-Station Men—Homer E. Niesz Elected Jupiter

As chronicled in last week's issue, the feature of the first day's session of the twelfth Jovian congress, held at St. Louis, Oct. 14 to 16, was the report of the Mercury, Mr. Ell C. Bennett. This report showed that the number of local chapters has increased from fifty-two to sixty-two, and that during the past year 3723 candidates were initiated. Of that number, Statesman Thomas A. Wynne, Indianapolis, obtained 319 members. The last potential issued this year will be 15,775, and the net membership is now 15,004. The financial statement showed a balance of $7,918.69 from the eleventh administration and a present surplus of $2,607.05. Since the amount invested in the Jovian roster was $2,900 and the cost of operating the commercial division was $2,535, the order is declared to be on a sounder financial basis than before, despite its smaller balance on hand.

A number of changes in the constitution and by-laws were proposed in the report, and as a result of these recommendations the United States, Canada and Mexico are now divided into fifteen Jovian congressional districts instead of ten. The annual dues of the order were not raised from $2 to $3 as was proposed. No roster will be published for the year 1914-1915. A reduction in the number of statesmen-at-large was made from fifty to twenty-five, and the amendment admitting large stockholders in electric companies to the order, regardless of their local occupation, was rejected.

Work of the Commercial Division

Among the accomplishments of the commercial division during the last year are the following: 14,504 letters have been written to members; fifty-three hotels have been persuaded to give Jovians 10 per cent discount on lodging bills; the employment bureau has filled numerous important positions and is making many friends for the order; it has been decided to promote intelligently organized and well-managed electric shows in many cities; a Jovian sales and technical educational course has been secured for members at 45 per cent less than such work could be obtained elsewhere; by means of skilfully prepared interviews newspaper publicity for things electrical has been secured in cities where rejuvenations were held; local leagues have been encouraged to participate in civic affairs and institute local co-operative advertising plans for electrical goods; unfavorable ordinances have been eliminated in several cities; architects' co-operation committees are being formed as outlined in the *Electrical World*, and an "efficiency wins" campaign similar to the "safety first" movement is being launched with the expectation of reaching everyone in the electrical business. The commercial division is proud of the work it has accomplished on an expenditure of $2,535 and the continued applause with which the report of Mercury Bennett was received showed that the delegates, too, were pleased with the practical work which has been done.

At the commercial division sessions a representative of each of the four branches of the electric-lighting industry spoke. Mr. John R. Galloway, president of the National Electrical Contractors' Association, represented the contractor; Mr. P. M. Lincoln, president of the American Institute of Electrical Engineers, represented the manufacturer; Mr. A. C. Einstein, president of the Union Electric Light & Power Company, of St. Louis, represented the central station, and Mr. W. E. Robertson, past-Jupiter of the Jovian Order, represented the electrical supply jobber.

Past-Jupiters' Fund

Mr. Robertson also made the report for the Past-Jupiters' Association. This body now controls a fund of about $5,000 derived from collecting and investing 2.5 per cent of the gross receipts of the order and from assessing each past-jupiter initiated a fee of $100. In years to come it is hoped that this fund will prove a financial bulwark and that the income from it may be used to carry on the work of the order.

Other speakers at the convention were Mr. George B. Muldaur, field representative of the Society for Electrical Development, Inc., New York, and Mr. Elbert Hubbard, East Aurora, N. Y. Mr. Hubbard twice entertained audiences, skilfully painting at one time a word picture contrasting the ancient conquerors of the world riding over bloody battlefields with the industrial conquerors of our country to-day, who are represented in the membership of the Jovian Order. On another occasion, while speaking of the possibilities of the Jovian commercial division, he related, during a few serious moments, a conversation between Dr. Steinmetz and Mr. Henry Ford in the office of Mr. Frank A. Vanderlip. The speaker said that Dr. Steinmetz predicted the ultimate use of the total power of Niagara, the loss of which now costs the nation $1,000,000 a day. The harnessing of this tremendous power and its application to automobiles as a measure of fuel conservation was considered in the conversation, declared the speaker, and the solution of even such problems as this is not beyond the possible scope of the Jovian commercial division.

Entertainment

Among the ample and varied entertainment features were a 40-mile automobile tour to Sunset Hill Country Club, followed by dinner and dancing; an inspection trip to the Anheuser-Busch brewery; luncheon for the visiting Jovian members of "rotary clubs"; degree-team competition in which the St. Louis team, with excellent work, won $250 cash and a loving cup, and in which Mr. Otto Kaburna, Chicago, as Vulcan, won the individual prize, a hundred-dollar jewel; annual rejuvenation, followed by a talk by Twelfth Jupiter W. N. Matthews; a Stentors' contest and a boxing match, and a banquet and vaudeville entertainment at Moolah Temple, which is the home of the St. Louis Shriners.

One of the interesting ceremonies during the convention occurred at Moolah Temple when Mercury Bennett was made the happy and surprised recipient of a five-piece silver service. In making the speech of presentation, Mr. Sam A. Hobson, Chicago, expressed the feelings of all assembled Jovians by stating that the gift was presented in sincere appreciation of services rendered and in the spirit of deep and respectful friendship.

Besides the entertainment for the Jovians, a number of parallel social functions were provided for the ladies, and with Mrs. W. N. Matthews as the able and amiable hostess, these events afforded great delight to every visiting woman. Events on the ladies' program were the automobile tour already mentioned, dedicated to the ladies as "Avrenim night"; an automobile trip through Shaw's famous botanical garden, an evening card party, a special luncheon at one of the large department stores, and a theater party.

Each of the winners at the card party received as a prize an electrical household device. The lucky contestants were Miss Blumberg, Chicago; Mmes. Sutter, St. Louis; Burnside, Poplar Bluff, Mo.; Einstein, St. Louis; Hoffmann, St. Louis; Lecock, Toronto; Robinson, Kansas City; Keech, Chicago; Rasmussen, Indianapolis, and Collins, St. Louis.

Election of Officers

Election of officers, which was announced just prior to the banquet at Moolah Temple, resulted as follows: Jupiter, Mr. Homer E. Niesz, Chicago, and Mercury, Mr. Ell C. Bennett, St. Louis. The following congressmen, elected from Districts 1 to 15, respectively, were awarded the offices which precede their names: Neptune, Mr. A. J. Binz, Houston, Tex.; Mars, Mr. V. C. Bruce Wetmore, Boston, Mass.; Vulcan, Mr. N. A. Oberlauder, New York; Pluto, Mr. J. C. Vogel, Philadelphia; Triton, Mr. A. E. Loeb, Columbus, Ohio; Avrenim, Mr. W. R. Hernstein, Memphis, Tenn.; Apollo, Mr. R. S. Stearnes, New Orleans, La.; Hercules, Mr. W. S. P. Mayo, Richmond, Va.; Ajax, Mr. F. B. Uhrig, Kansas City, Mo.; Argon, Mr. L. H. Cooper, Minneapolis, Minn.; Amphion, Mr. E. A. Wetmore, Boise City, Idaho; Atlas, Mr. H. A. Hibbaid, Denver, Col.; Comus, Mr. J. G. Pomeroy, Los Angeles, Cal.; Chiron, Mr. W. J. Doherty, Montreal, Canada; Cadmus, Mr. W. H. Reynolds, Winnipeg, Man.

PRESIDENT-ELECT H. E. NIESZ

The Jupiter-Elect

Born at Canton, Ohio, Jan. 22, 1868, Mr. Homer E. Niesz attended the common schools of Canton and vicinity and, entering Mount Union College, was graduated in 1886. Specializing in mathematics during his college course, Mr. Niesz was attracted to things electrical, and, seeking practical experience, he entered the shops of the Western Electrical Company, Chicago, as an apprentice in the arc-light-machine manufacturing department and later worked in the testing department. He afterward became connected with the United States Lighting Company, Chicago, working as a wireman's helper, and on going with Messrs. Leonard & Izard, Western agents for the Edison General Electric Company, he assisted in the installation of a number of the early Edison lighting plants. Mr. Niesz accepted a position with the Chicago Edison Company in 1888, in the capacity of assistant superintendent of construction. He was made assistant to the general superintendent in 1899, and later was promoted to the position of assistant to the second vice-president. He resigned in 1909 to become manager of the Cosmopolitan Electric Company, and a year ago, upon the absorption of that property by the Commonwealth Edison Company, Mr. Niesz was appointed secretary of the budget and expense committee of the Commonwealth Edison Company. He says that during his administration of the Jovian Order every officer must be a worker.

Business Conditions in the Industry

Opinions and Facts Bearing on the Indirect and Direct Effects of the European War on Domestic and Foreign Trade

H. HOBART PORTER ON BUSINESS

Average Earnings of Public Utility Companies Holding Up Well Under War Influence

Mr. H. Hobart Porter, of Sanderson & Porter, finds that the average earnings of public utility companies with which he is in close touch are holding up well under the disturbed financial conditions arising from the war. In talking with a representative of the *Electrical World* he spoke particularly of the affairs of the American Water Works & Electric Company, of which he is president, but also of other utilities in which he is interested.

Mr. Porter said that while the rate of increase in gross revenue of the operating properties controlled by the American Water Works & Electric Company is smaller than in previous years, it is still good. Since May 1, the date of formation of the new company, the rate of increase over the corresponding period of last year has been nearly 50 per cent better than the rate of increase in the similar period of 1913 as compared with 1912. Included in the company there are a good many properties furnishing different classes of utility service. Some of these, on account of special influences arising from the disturbance of industry as a result of the war, show actual decreases in business. General observations seem to indicate that the slackening of industry affects transportation companies very early. Of the transportation companies the steam properties, which are so largely dependent upon freight for their great volume of revenue, are affected first. Electric transportation, furnishing the local service in cities and short-haul service between communities, is affected to a lesser degree. Electric central stations are affected to a still smaller degree except where a large amount of the consumption is required in manufacturing industries that are closed down. Water companies have a tendency to show only a decreased rate of growth rather than an actual falling off in business.

Co-operation from Municipalities

One development of the situation which Mr. Porter mentioned with pleasure was the fact that it has been found that in most cases municipal and other public authorities have co-operated in every way in helping the properties to make the best of the financial conditions imposed upon them by the war. In all such cases, where municipal authorities were acting in the best interests of the public as a whole, they met the companies in a spirit of co-operation and aided them in their necessary effort to make the best of the imperative postponement of construction outlays.

Public utilities, Mr. Porter said, are not affected as much directly as they are through the influence of the financial conditions which up to this time have prevented the sale of securities to provide funds for capital requirements. There is, of course, an indirect effect, arising from demoralization of the market for cotton so far as the Southern States are concerned and from reduced consumption of iron and steel products in the Pittsburgh district. Other similar conditions exist in localities which are largely dependent on products that in some way have their market affected by the war. In some of the sections of the Northwest in which Sanderson & Porter are interested, and in the great central Western States, the agricultural communities generally are exceedingly prosperous. In the wheat-growing districts of Washington, for instance, farmers are getting $1 or $1.10 a bushel for wheat as compared with prices in former years of about 60 cents to 70 cents. Since the cost of production is not over 50 cents, they are making a large profit and are feeling prosperous and spending money freely.

Holding Companies' Advantage

Mr. Porter added that the present crisis seems to have demonstrated some of the principal advantages due to holding-company ownership of public utilities as compared with independent ownership. An investor in the securities of a holding company has the added protection arising from diversity in the ownership of operating plants. The frequent result of this condition is that the decline in earnings of a plant in one locality is overcome by increased earnings in other plants. Holding companies have found it possible to secure capital for urgently needed improvements for controlled properties at times when independently owned utilities have not been able to do so. In a holding company which controls properties situated in different localities and carrying on different classes of business a large reduction in revenues of the properties as a whole seems to be less likely to take place. The total operating results of the entire system are a merger of the returns from all classes of the business. In the consolidated returns the conditions which cause a falling off in one branch of the business are not so likely to be apparent, because these conditions may have had very little effect upon other branches.

The most important new construction work of considerable magnitude which Sanderson & Porter are carrying on at present is building oil-pipe lines from the California oil field to San Francisco Bay for the Valley Pipe Line Company, a subsidiary of the Shell Royal Dutch Oil Company, and a hydroelectric development at Cohoes, N. Y., for the Cohoes Company. None of the public utilities in which they are interested is undertaking any new construction work. Such construction work as is being carried on at present is that which is absolutely necessary or was under way and almost completed, and therefore required a comparatively small expenditure to be ready for operation.

When Mr. Porter was asked his opinion as to the duration of present conditions, he said that because the situation is so unusual he felt that he could not judge it. The best observers in Europe are talking of a war of comparatively long duration, and if this expectation is borne out by events, it would seem that present conditions must continue or possibly grow worse. If, however, their prediction of a comparatively long war should not be accurate, this would have an immediate and overwhelming influence over all other considerations. In any event, the increased cost of capital must be marked for some time, and this must have a very radical effect on the future course of public utility financing. All over this country rate-regulating public bodies have made decisions which, as a rule, have been based on the assumption that capital could be had at rates substantially less than those experienced in the initial promotion of utilities. If our utilities are to continue to grow under the conditions that now prevail, a much more liberal attitude must be taken by public authorities in reference to rates of return on capital.

VIEWS OF MANUFACTURERS ON OUTLOOK

Prospects for Business and Steps Taken to Develop Export Trade

Opinions on the outlook for domestic and foreign trade have been expressed by manufacturers for the *Electrical World* as follows:

Will Increase South American Exports

Mr. J. H. McGill, president McGill Manufacturing Company, Valparaiso, Ind.: "Our sales for June and July were practically equal to the sales for the corresponding months last year. In fact, July, 1914, sales were slightly in excess of July, 1913, sales. Our August sales were 13.48 per cent less than in the corresponding month last year, and indications for our September sales were for a falling off of at least 10 or 15 per cent. As we know of no other reason why our sales should show a decrease, we attribute it to the effect of the European war. In our opinion, the effect of the war will increase export business to South American countries. I do not believe, however, that it will stimulate our export business to Canada. We have not increased or decreased our organization as yet, but are accumulating a stock larger than we usually carry, and unless demand increases we must eventually lay off some of our employees. We hope, however, that by increasing the efforts of our selling organization we may be able to dispose of our specialties in such quantities as will enable us to keep our employees at work. We are not dependent upon European countries for raw materials to any great extent, and on a few items we are fortunate in having a sufficient supply to last us for some time to come. On one item, aniline dyes, it would be hard for us to substitute an American product that would be satisfactory."

Exhibit as Introduction to South America

Mr. William H. Bristol, president Bristol Company, Waterbury, Conn.: "Demands from South America for our product have been comparatively limited, and we have not as yet taken steps toward increasing our organization to develop the export trade, but are planning for an exhibit at the Panama-Pacific international exposition and count largely upon this as a means of advertising and reaching the South American customers through visits to San Francisco during the period the exposition is open. We estimate that many South American people will visit the exposition instead of going to Europe, and this will give us an opportunity of which we want to take advantage."

Looks for Boom After Few Months

Mr. Paul J. Kruesi, treasurer and manager of American Lava Company, Chattanooga, Tenn.: "Our opinion as to the effect of the war is that after an interval of a few months, in which manufacturers will adjust themselves to conditions, we shall have a boom such as we never had before. It stands to reason that, Germany's enormous export business in the electrical line being cut off, there will be a fine opportunity for enterprising American manufacturers and no reason why, having once obtained the business, they should not hold it permanently. Believing this way, we do not expect that our own business will be diminished. We have not reduced our organization, but on the contrary have let contracts and increased our facilities since the outbreak of the war.

"We have not taken definite steps to develop export trade in the electrical line, for the reason that ours is a peculiar proposition, our goods being made only for apparatus manufacturers, which makes it impracticable to seek export business, as we could do were we making line insulation, for example."

FIRM BASIS FOR LATIN-AMERICAN TRADE

Business Men Caution Manufacturers and Outline Safe Plans for Development

A report of the Latin-American trade committee appointed by Secretary of Commerce Redfield under a resolution adopted at the informal Latin-American trade conference, called at Washington, D. C., on Sept. 10 by the Secretary of State and the Secretary of Commerce, has been made public. The committee feels that articles appearing recently in the press regarding commercial opportunities in Central and South America have unduly emphasized the promising aspects thereof and have, in most instances, failed to state that our exporters already doing business with these regions find that their sales have been decreased, rather than increased, owing to the war.

It is the belief of the committee that an opportunity is afforded to place United States trade with other American nations upon a firm foundation, supporting a more comprehensive structure which may be built as the situation again more nearly approaches normal. However, there is great danger that merchants and manufacturers unfamiliar with Latin-American conditions may be induced by recent publicity to undertake ventures in that field which not only will be unremunerative but actually disastrous and, in their ultimate result, make for a reaction of the very healthy and much-to-be-desired interest in foreign trade now manifest throughout the United States, an interest which, if well directed, should be of great permanent value.

The committee believes that the present disorganization of the trade of the United States with Latin America may best be remedied and placed on a permanently satisfactory basis as follows:

(1) The establishment of a dollar exchange—(a) by the ultimate creation of a discount market, (b) pending the establishment of a discount market, by the extension of adequate accommodation by banking institutions and the establishment of reciprocal balances in the United States and in Latin America for financing Latin-American trade.

(2) Perfection of our selling machinery—(a) by furnishing additional support to commission houses already familiar with Latin-American business, (b) by forming associations of merchants and manufacturers to be jointly represented in Latin America, (c) by obtaining information as to the possibilities of developing retail stores in large Latin-American cities.

The members of the committee are Messrs. John Barrett, director-general of the Pan-American Union, Washington; William Bayne, president New York Coffee Exchange; W. B. Campbell, president Perkins-Campbell Company, Cincinnati; Robert Dollar, president Robert Dollar Company, San Francisco; James A. Farrell, president United States Steel Corporation and chairman National Foreign Trade Council; William A. Gaston, president National Shawmut Bank, Boston; J. P. Grace, president W. R. Grace & Company, New York; Fairfax Harrison, president Southern Railway; Alba B. Johnson, president Baldwin Locomotive Works; C. J. Owens, managing director Southern Commercial Congress, Washington; Lewis W. Parker, president Parker Cotton Mills, Greenville, S. C.; William E. Peck, president William E. Peck & Company, New York; William Schall, Müller, Schall & Co., New York; W. D. Simmons, president Simmons Hardware Company, St. Louis; Willard Straight, with J. P. Morgan & Company, New York; E. P. Thomas, president United States Steel Products Company; J. H. Waddell, Hard & Rand, New York; Daniel Warren, American Trading Company, New York, and Harry A. Wheeler, vice-president Union Trust Company, Chicago.

PUBLIC SERVICE COMMISSION NEWS

New York Commissions

The Second District Commission has granted the application of the village of Bath for authority to supply electric energy to the public from a municipal plant as well as to furnish energy for street lights and other municipal purposes. The application was opposed by the Bath Electric & Gas Light Company, which at present is furnishing energy to private consumers in Bath.

Commissioner Emmet, who wrote the opinion, holds that in this case competition is justified because the private company has not been able for a long time to furnish satisfactory service at satisfactory rates, and while his opinion seems to show that the granting of the present application may mean the wiping out of the private company, he finds no other alternative and declares that it would be fair for the municipality to buy the private plant. The village refused recently to renew its contract for street lighting with the company and began the erection of a municipal plant to supply energy for this purpose. Mr. Emmet points out that the village had a perfect right to do this under the law. The authority of the commission is needed only when the plant does other than municipal business. He finds, however. that there is not enough business in Bath for the successful operation of two electric plants. The opinion says:

"We commence the consideration of this case with the certainty that, whether we grant the present application or not, a municipal plant is to be established. Adverse action merely means that the new plant will have to be limited in the manner I have mentioned. The matter has already gone too far to make it possible that the plant will not be established. The work of constructing the plant has been largely completed. The existing company has apparently never been able to give the people a service which was in the least degree satisfactory to them.

"No matter whether the inhabitants of Bath in deciding to maintain a municipal plant of their own acted wisely or foolishly, the step has been taken. The business of the municipality is already assured to the new concern, and as matters now stand the only hope that individual consumers have of enjoying good electric service in the near future seems to lie in the same direction."

Ohio Commission

While the commission held, in fixing rates for the Bucyrus Light & Power Company, that a company is not entitled to a return of 6 per cent on the investment if the business has been managed improperly and the expenditures have been greater than required, it also decided that the rates named in an ordinance passed by the Bucyrus City Council are unjust and unreasonable. Some time ago the commission had the property appraised and found a value of $95,000, which is much less than the company claimed. The commission found that the company could not earn a fair rate of return, even on the valuation found, at the rates named by the Council. No dividends had been paid for some time.

For residences and all commercial consumers using less than 30 kw-hr. per month the rate was fixed at 10 cents per kw-hr. by the commission. The other rates are 7 cents for from 30 kw-hr. to 60 kw-hr. and 3 cents for all above 60 kw-hr. The rate for window lighting is 7 cents and that for motor service from 5.85 to 2.16 cents, according to the amount used. The commission made a reduction from the old rates of about 15 per cent in the commercial service, and also for others using more than 30 kw per month, but motor-service rates were not changed. The new minimum rate is 50 cents per month instead of $1, as under the old rules.

Current News Notes

TAKES NICKELS AND COUNTS THEM.—Electrically driven machines for taking and counting nickel car fares on the prepayment plan have been installed in the new Boylston Street subway stations, Boston, Mass.

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THE WISE CHICKENS OF KENTUCKY.—One of the most pleasurable pastimes enjoyed by barnyard fowl is bug catching, and according to a dispatch from Danville, Ky., the chickens in that little city are in the habit of continuing their search for insect food at night under the city's arc lamps. It is gratifying, according to the local constable, to see that the chickens are taking advantage of the newer type lamps, which are designed so that the bugs have to stay on the outside of the globes. A few years ago, he comments, a chicken under an arc lamp would have starved while waiting for a bug to escape from the lamp itself.

* * *

MOTOR TRUCKS FOR HAULING FOODSTUFFS.—In its report to Mayor Harrison, the Chicago Municipal Markets Commission makes the statement that the average cost of hauling in the city by motor truck is 11.25 cents per ton-mile, as compared with 17.75 cents per ton-mile by horse. This shows a saving of 36 per cent in favor of the trucks. The average cost of deliveries by department stores, grocery stores and meat markets, according to the commission, is approximately 8 cents by motor and 16 cents by horse. Analysis further shows that the average cost of operating motor trucks and delivery wagons, including both the gasoline and electric types of machines, is $10.97 a day, inclusive of all items of operation and maintenance, such as driver, garage, interest and depreciation. The average cost of doing equivalent work with horses is $16.75 a day, which represents the expenses of from two to three wagons with drivers.

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SOCIETY MEETINGS

SOCIETY FOR THE PROMOTION OF ENGINEERING EDUCATION.—The 1915 meeting of the S. P. E. E. will be held at the Iowa State College, Ames, Ia., June 22 to 25, 1915. Dean Anson Marston of this college is president of the society.

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CONSULTING ENGINEERS.—At a dinner meeting of the American Institute of Consulting Engineers to be held at the City Club, New York, at 8 p. m., Nov. 12, the subjects for discussion will be: "A Memorial to Alfred Noble," "Legislation for the Registration of Engineers," and "The Coming Constitutional Convention in New York State."

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WELCOME TO RETURNING JOVE.—The luncheon of the Chicago Jovian League, Oct. 19, took the form of a rousing welcome to the Jupiter-elect of the Jovian Order, Mr. Homer E. Niesz, who is president of the local league. Addresses were made by Jupiter Niesz, Past-Jupiter Sam A. Hobson, Statesman Perry A. Boole, and the tribune for Chicago, Mr. Victor Tousley.

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ILLINOIS CONVENTION POSTPONED TO 1915.—The Illinois Electric Association has postponed until some time next summer the meeting originally scheduled to be held the latter part of this month at Starved Rock Park, near Ottawa, Ill. A one-day session had been planned, with three hours' discussion on general topics. The change in plans is announced by the secretary, Mr. H. E. Chubbuck, vice-president executive of the Illinois Traction Company, Peoria, Ill.

Hydroelectric Development on Bishop Creek, Cal.—II.

Difficulties encountered and overcome in construction of the Hillside Tunnel — The layout and equipment of generating stations A and No. 1. By C. O. Poole

As before stated, both the Middle Fork and the South Fork reservoir sites were natural lakes formed by glacial action. When the hydrographic survey of the South Lake was made, it was discovered that the lake was quite deep, and as the bed of the stream below the dam site dropped off precipitously, it was apparent that there was an opportunity to drive a tunnel from below the dam site and tap the lake at a considerable depth below the outlet pipes of the dam. Calculations were made, and it was found that a tunnel 2000 ft. in length would tap the lake 65 ft. below the base of the dam.

Work on this tunnel, known as the Hillside Tunnel, was commenced in the fall of 1908. A temporary water-power plant was installed, utilizing the fall in the creek directly below the dam site, and an auxiliary steam plant was constructed for driving air compressors, ventilating fans, etc. The tunnel was started in the bed of the creek, 600 ft. below the dam site, at the foot of a granite cliff, which, in the shape of a huge hog's back, extended north and south under the dam site and into the lake. The tunnel was started in the side wall of the cliff, and it was necessary to drive it into the ridge at an angle to insure a rock wall strong enough to withstand the pressure of water to which it would be subjected. Where the tunnel reached the proper point on the line with the survey, it was straightened and driven to the nearest point in the lake to give the required depth. The tunnel was made 5 ft. wide and 6 ft. high and ran on a grade of 2½ ft. per 1000 ft. At a point 1000 ft. upstream above the dam the ridge referred to is 30 ft. above the outlet pipes of the dam and forms an island in the lake, which is submerged about 40 ft. when the reservoir is full.

In order to expedite the work of driving the tunnel, a shaft was sunk on this island in line with the tunnel and work started in both directions from this shaft. The shaft also served as an additional safeguard for the

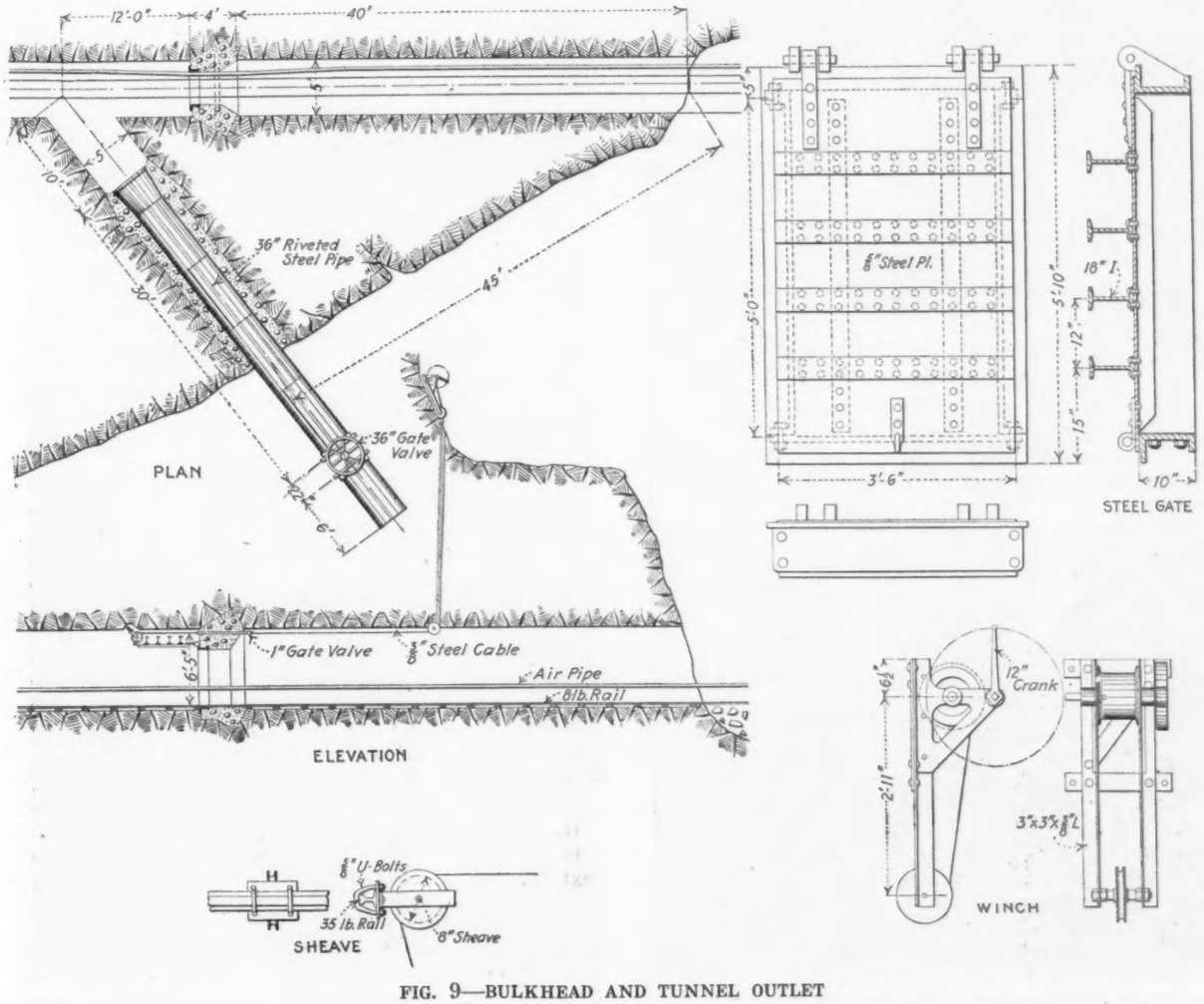


FIG. 9—BULKHEAD AND TUNNEL OUTLET

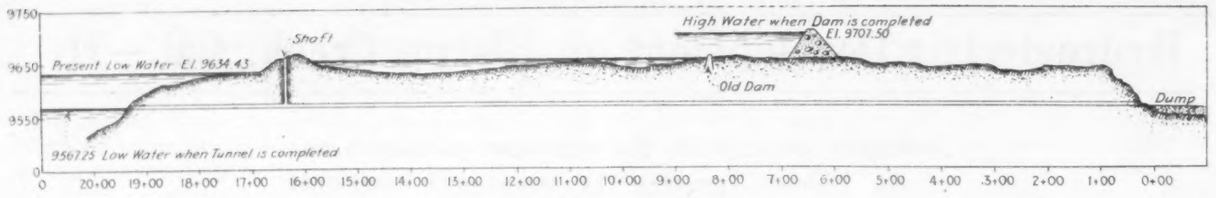


FIG. 10—PROFILE OF TUNNEL

men at work in the tunnel. Careful soundings were made of the end of the ridge, where the tunnel was to break through, and the profile was platted. There was, however, one uncertain element to deal with, because it was not possible to determine whether or not the end of the bank was solid or shattered rock, as the soundings were made by cutting holes through 2 ft. of ice and sounding through 65 ft. of water. It, therefore, became necessary to use extreme care in driving the tunnel as it neared the breaking-out point.

When the face of the tunnel was within a distance of 50 ft. of the finish a drill hole was kept ahead of the face from 10 ft. to 15 ft. Within about 20 ft. of the survey terminus bad loose ground was encountered and mud and water came through the fissures in the rock, so it was considered unsafe to proceed further. This was in December, 1910, and the lake was frozen over with nearly 2 ft. of solid ice, the temperature being near zero. For several weeks prior to this time the special powder house was kept heated with steam to prevent the powder from freezing. Calculation was made as to the amount of powder that would be required to blow the opening through the remaining wall of rock, assuming it to be solid. The tunnel was gouged out on each side at the face for a distance of 5 ft., leaving the end of the tunnel in the shape of a "T," 15 ft. across the face. As considerable water flowed, it was necessary to drain this off while the charge of powder was being placed, and, the temperature of the water and tunnel being below the congealing point of the powder, the charge had to be placed as quickly as possible and fired before the temperature lowered to a dangerous point. Some 4-in. by 4-in. timbers were laid across the tunnel at the face, and the powder was placed upon these timbers to keep it away from the bottom of the tunnel and the water. The explosive in the regular 50-lb. boxes was placed one box on top of the other, with the covers off. The greater part of the powder used was 40 per cent giant, with about 1000 lb of 20 per cent stump powder and about 500 lb. of 60 per cent gelatine powder in addition, making 5200 lb. in all. Before placing the powder two 3-in. iron pipes reaching outside the

FIG. 11—LAKE END OF HILLSIDE TUNNEL

FIG. 12—INTAKE END OF HILLSIDE TUNNEL

tamping were laid in the bottom of the tunnel for a distance of 40 ft., to drain the water away from the powder.

The charge was primed by using twelve detonation caps placed in two sets of six each in a stick of 60 per cent powder, and each of these sticks was placed in a box of the same kind of powder. Two sets of wires were carried out through tamping in 2-in. iron pipes, the ends of the wires being carried up through the shaft to a safe distance on shore and attached to separate exploders. In addition to this priming, two sets of three fuses were brought out in the same way, so that if the battery failed the charge could be fired with the fuses. The tunnel was hurriedly tamped with fine muck for a distance of 30 ft. back of the powder, and a space of about 6 ft. was left next to the powder for a gas chamber.

A very serious problem here presented itself: If the charge should explode and blow out into the water and at the same time not blow out the tamping, it would be a difficult and hazardous task to remove the tamping to allow the water to flow into the tunnel. To lessen this danger four boxes of powder were placed in the tamping, spaced about 5 ft. apart, and wires were brought out so they could be exploded if the main charge did not clear the passage. Fortunately, however, the main charge exploded the tamping charge, for no unburned powder was afterward found in the tunnel. The charge, moreover, fired on the first stroke.

Before firing the charge powder was used to break the heavy ice directly over the end of the tunnel to give it more freedom. The shot threw a column of black mud, water and rock to a height of 300 ft.

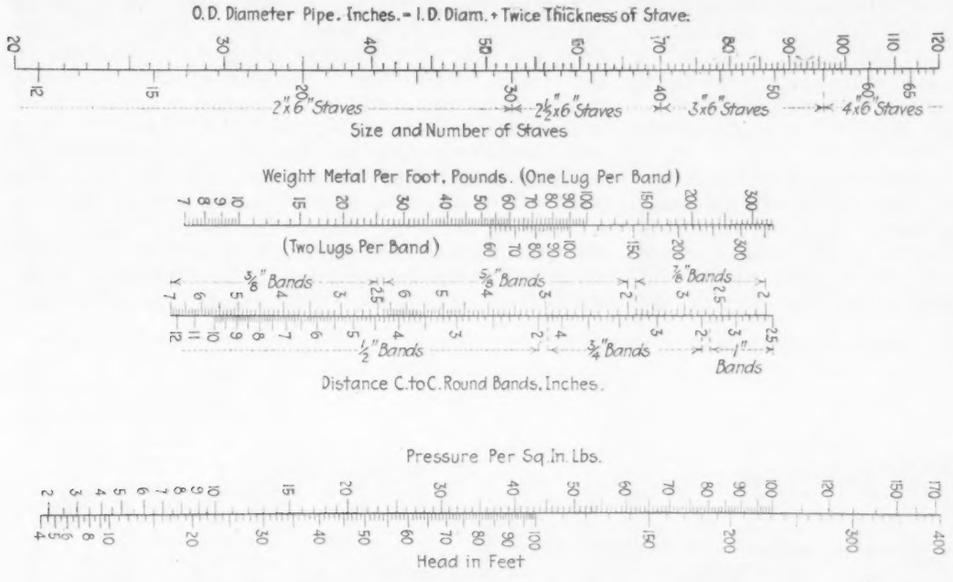


FIG. 13—DIAGRAM FOR WOOD-STAVE PIPE CALCULATIONS

The method employed to control the water in the tunnel is shown in the diagram Fig. 9. A side tunnel was driven into the solid rock wall for a distance of 35 ft., intersecting the main tunnel at an angle. In this branch tunnel was placed a 36-in. diameter bell-end steel pipe ⅜ in. in thickness. This pipe was securely concreted in the rock tunnel, and a cast-iron gate was placed on the outer end of the pipe. At a point in the main tunnel 10 ft. outside the intersection with the branch tunnel was placed a trap gate supported upon a heavy cast-iron frame, embedded in the tunnel walls and secured there with concrete. The trap gate is of ⅝-in. plate steel, heavily reinforced with steel "I" beams, as shown in Fig. 10. The opening is 3 ft. wide by 5 ft. in height, large enough for the rock cars to pass through, as they did for months before the tunnel was completed. The branch tunnel and pipe were also completed long before they were needed. The trap gate was hinged at the top of the framework and opened toward the lake, a hole was drilled through the roof of the tunnel directly above the gate, and the gate was held up against the roof by means of a ⅜-in. steel cable handled by a small winch.

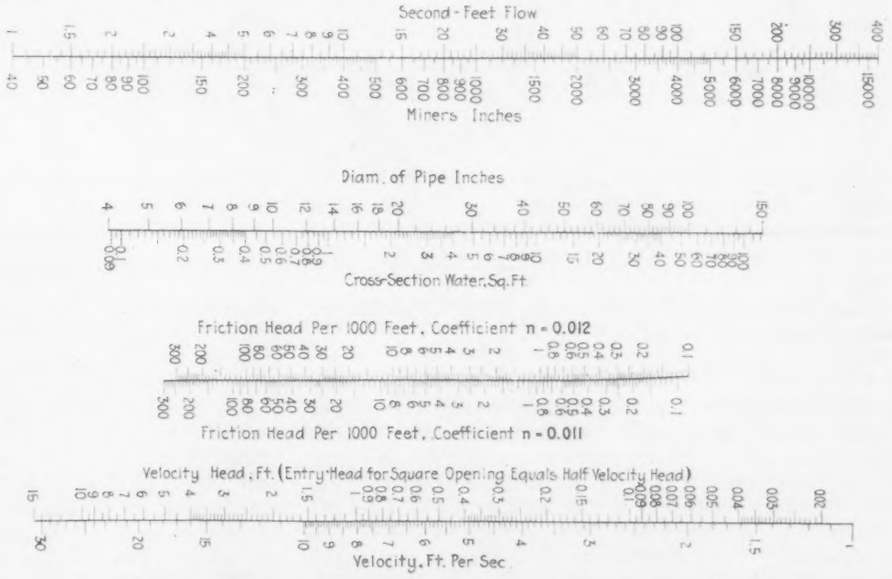

Second-Feet Flow
Miners Inches
Diam. of Pipe Inches
Cross-Section Water, Sq. Ft.
Friction Head Per 1000 Feet, Coefficient n = 0.012
Friction Head Per 1000 Feet, Coefficient n = 0.011
Velocity Head, Ft. (Entry Head for Square Opening Equals Half Velocity Head)
Velocity, Ft. Per Sec.

FIG. 14—DIAGRAM FOR DETERMINING FLOW OF WATER IN PIPES

When the shot was ready to fire, the trap gate was left wide open, and the 36-in. outlet gate was left about half open. A man was placed at each gate with instructions to close the gates as soon as the shot was fired and he heard the water rushing in the tunnel, the object being to trap sufficient air in the tunnel to cushion the shock on the gates and prevent any possibility of their

being carried away. The instructions were carried out to the letter, and the water was successfully controlled without any damage to any part of the system.

As an additional safeguard in controlling the water in the tunnel, a large gate, 3 ft. by 5 ft., was placed in the tunnel at the shaft on the island and operated by means of a vertical shaft reaching up to within 10 ft. of the surface. By the use of this gate the water pressure can be kept off the tunnel. In order to keep the water out of the shaft when the island is flooded, a water-tight manhole is provided at its surface and taken off each season when the water is drawn to this level by the pipes through the dam. Fig. 10 is a profile of the tunnel.

Fig. 11 shows the lake end of the tunnel where the final shot was fired. Considerable work was necessary to clear out the opening and make it safe for again submerging. The rock was found to be badly shattered and decomposed. A deep cut had to be made in the cliff and the tunnel timbered with heavy mine timbers, the top and sides being filled with rock. Fig. 12 shows the lake entrance as it was finally finished.

Generating Station A

Plans are made for the installation of two power plants connecting directly to the reservoirs. On the South Fork provisions are made to connect the flow pipe directly to the outlet pipe of the Hillside reservoir tunnel. By carrying this flow line on a grade of 4 ft. per 1000 ft. for a distance of 5500 ft. a drop of 550 ft. can be obtained. With a pressure pipe 1300 ft. in length this plant will utilize the reservoir pressure in addition to the natural fall of the creek, making a total available head of 650 ft. This plant is designated as Plant A in the development and will comprise one generating unit rated at 3000 kw. Using impulse wheels and a 2200-volt, three-phase, sixty-cycle generator, the voltage will be raised to 87,000 volts and ultimately to 140,000 volts by means of three 1000-kw transformers.

The generating station will be situated at the upper end of a meadow that is one-half mile in length up and down the creek, and which furnishes an excellent storage forebay for Plant No. 1. The intake dam for Plant No. 1 will back the water up to the tailrace of Plant A, thus preventing any loss of head.

Generating Station No. 1

The generating stations on the stream are numbered consecutively in their order, looking down the stream from the reservoirs, Plant A being the highest one up the stream. Plant No. 1, the plan of which is shown in Fig. 16 herewith, will be situated on the Middle Fork of the creek at No. 2 intake, and the tailrace of this plant will discharge directly into the forebay of Plant No. 2. All three branches of the creek are to be utilized in this plant. A reinforced-concrete forebay dam will be constructed at the lower end of the meadow referred to and will impound 2000 acre-ft., with a 30-ft. dam. The water will be led directly from the dam through a 54-in. wood-stave pipe, 22,600 ft. in length, laid on a bench excavated on the side hill through rock and earth. This bench will be 9 ft. in width and have a uniform grade of 2 ft. per 1000 ft. The banding of the pipe will be graded to suit the pressure, the spacing of the bands varying from 8-in. centers at the upper end to 3½-in. centers at the lower end. The staves will be of California redwood, 2½ in. thick, and the bands will be of ⅝-in. soft steel, having 60,000 lb. tensile strength and an elastic limit of 30,000 lb. The bands will be made up in two pieces, and two malleable-iron shoes will be used per band. The spacing of the bands is based upon a factor of safety of four in the steel, taking into consideration initial stress. It has been found by experience, however, that the initial stress in wood pipes disappears after a few months' use under pressure, as the bands are found quite loose when the pressure is taken off the pipe.

Fig. 13 is a diagram evolved for wood-stave pipe calculations and found quite useful. After the water is turned into the flow line and the leaks are taken up, the

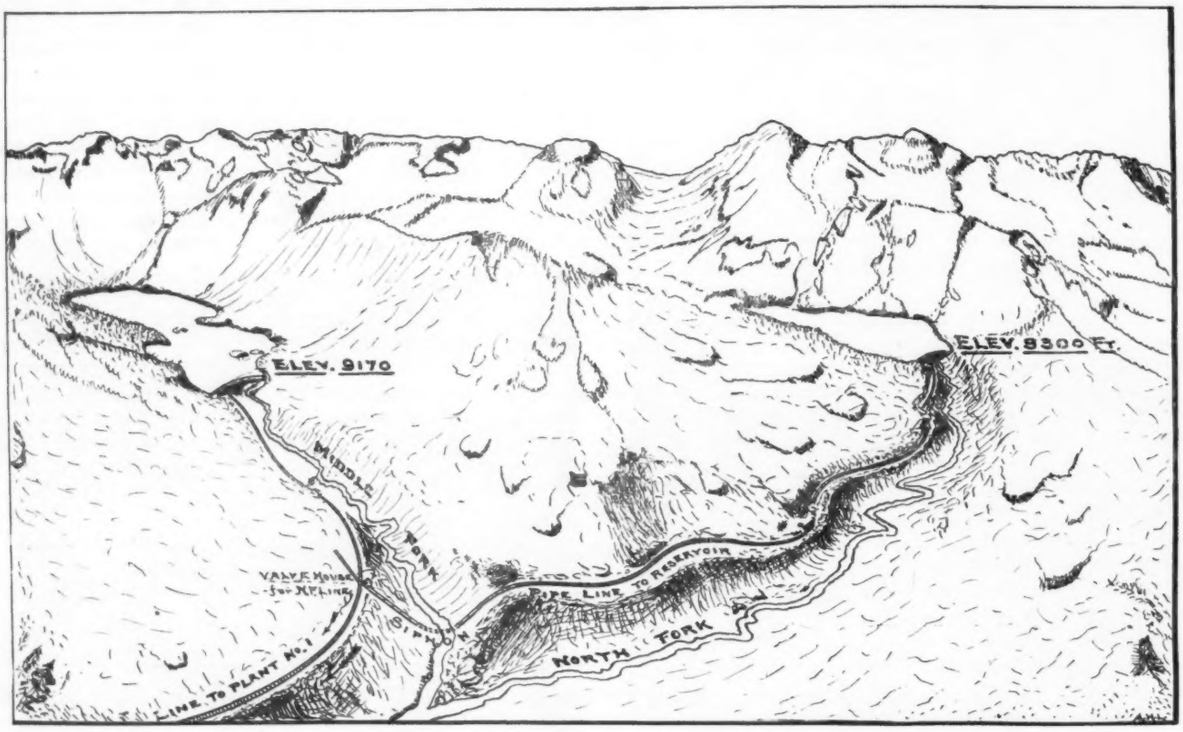


FIG. 15—SIPHON CONNECTION BETWEEN NORTH AND MIDDLE FORKS

pipe will be covered with earth to a depth of 10 in. A hand-placed rock wall will be erected on the down-hill side of the pipe to keep the earth in place. The writer has found that if wood pipes are kept covered with earth to a depth of 9 in., even in warm climates, the evaporation from the surface of the staves will be retarded sufficiently to permit the staves being kept moist on the outside all the time, and, being saturated clear through, the staves are not subject to rapid decay. One pipe has been in use nine years, and the staves are in fair condition to-day.

At three different points along the flow line there will be installed 54-in. steel stand pipes, placed in the ground on the steep hillside. These pipes will extend 20 ft. above the water level in the intake and will serve as surge pipes to prevent dangerous over-pressure occurring in the pipe line. At every 1000 ft. along the pipe there will be placed an 8-in. inlet gravity air valve to prevent the pipe from collapsing in the event of a break in the pipe.

In addition to the water from the reservoir, this pipe will carry several small streams that enter the forebay. The normal carrying capacity of this pipe will be 100 second-ft., based on Kutter's value of $N = 0.012$, which the writer finds in practice is quite safe. Fig. 14 is a straight-line diagram based on Kutter's formula, which has been evolved by the engineers.

The flow line will terminate against a precipitous rock cliff on the bank of the Middle Fork of the creek, having passed over the ridge that divides the two streams. It was first intended to extend this flow line around this cliff a half mile and intersect the flow line coming from the Middle Fork reservoir, and to use one pressure line to the generating station; but because of the different lengths of flow lines and the excessive cost of the extension it was deemed best to use a separate 40-in. pressure pipe for each flow line, and the designs are made in this way.

The generating station will contain one 7500-kw two-bearing generator, with an overhung impulse wheel on each end of the shaft, each wheel to have a maximum rating of 5000 kw. The South Fork pressure line will lead directly to a single nozzle controlled by a 30-in. steel gate. The stream to the wheel will be controlled by a hand-regulated needle, and governing will be accomplished by stream deflectors actuated by directly connected oil-driven governors, one governor controlling the South Fork and the Middle Fork nozzles by means of a rock shaft and cranks.

The Middle Fork flow line will connect directly to the outlet pipes of the reservoir, the three pipes being joined together and connected to a 48-in. wood-stave pipe after passing through a double by-pass pressure screen, which will be so arranged that one of the two sets of screens can be cleaned without interfering with the flow of the water. The flow line will be 13,500 ft. in length, laid on a grade of 4 ft. per 1000 ft., and will have a carrying capacity of 100 second-ft. with the grade pressure. The total static head at the lower end will be 120 ft. with the reservoirs full.

The North Fork reservoir is 1.5 miles from a convenient point on the Middle Fork flow line, at an elevation of 220 ft. above the level of the flow-line grade. This branch of the stream will be brought into use by carrying the water through a 30-in. steel pipe intersecting the Middle Fork flow line at a distance of 4000 ft. below the Middle Fork dam. At the point of intersection a 48-in. steel standpipe will be erected, laid in the ground on a steep hillside, the top of this standpipe to extend 20 ft. above the high-water line in the Middle Fork reservoir, thus preventing the extra pressure of the North Fork reservoir from coming on the wood-stave flow line. At the point of intersection of the two pipe lines there will be a gate in the North Fork line and a gate in the Middle Fork flow line, placed between the standpipe and the generating station, for use in case of necessity for regulating the flow of water. In the event of the water being cut off at the generating station and the North Fork gate being open, the water would flow back through the Middle Fork flow line and enter the reservoir without throwing excess pressure on the pipe or spilling at the standpipe. By this same means the storage between the two streams can be equalized. Fig. 15 shows the arrangement. At the lower end of this flow line there will be placed a second 48-in. standpipe to act as a surge tank. The wood pipe will connect to a 48-in. steel gate, the 40-in. steel pressure pipe connecting to the other side of this gate. The flow line, like the South Fork line, will be provided with 8-in. drop air valves every 1000 ft. The upper section of both pressure lines will also be provided with air valves. The pressure line will terminate in a single nozzle, like the South Fork line, the lines being duplicates in every respect.

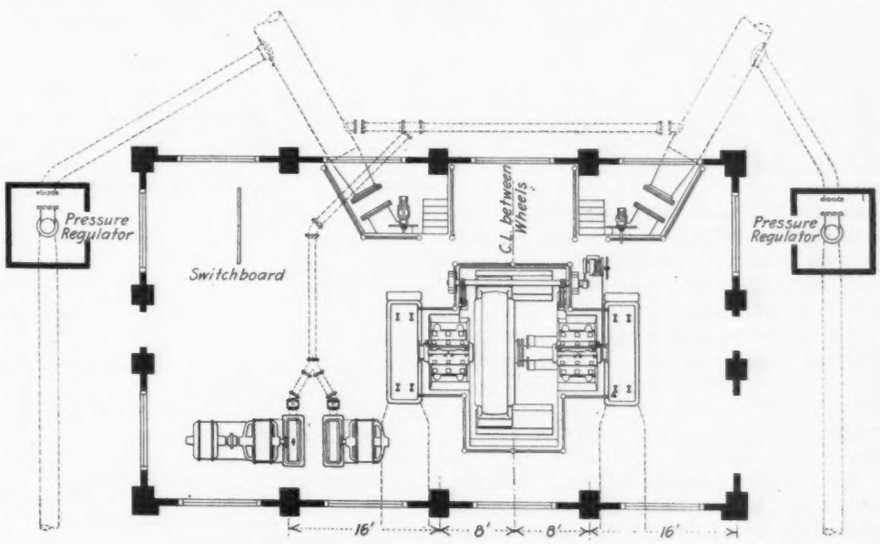


FIG. 16—PLAN OF STATION NO. 1

The general layout of the station is shown in Fig. 16. The generator will be wound for 2300 volts, three-phase, sixty cycles, and operate at 240 r.p.m.

There will be two 60-kw, 110-volt exciters, one driven by a single impulse wheel and the other driven by an impulse wheel and also directly connected to a 100-hp, 2200-volt, three-phase induction motor. The unit without the motor will be controlled by a waterwheel governor and the voltage will be governed by a Tirrill regulator. The switchboard will consist of simply one generator panel and one double exciter panel. Leading directly from the switchboard bus will be the feeders to the transformer bank, consisting of three 2250-kw water-cooled, single-phase transformers of outdoor type.

Air-Gap Reluctance and Tooth Ampere-Turns

A method of accounting for the phenomenon caused by the presence of air-gap in computing the ampere-turns required by the teeth of a dynamo. By John F. H. Douglas

AT this date the best method of computing the ampere-turns required by the teeth of a dynamo is that of Parshall and Hobart.[1] They assume that the circular cylinders passing through both the tips and the roots of the teeth are both equipotential. By this means they obtain curves of real and apparent flux density. This method is open to a serious objection in

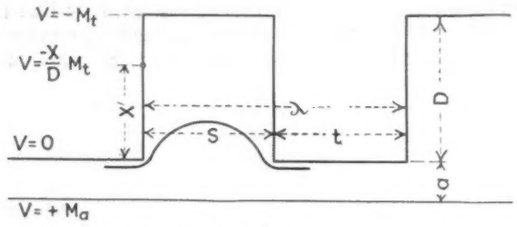


FIG. 1—DIAGRAM OF FIELD OF FORCE

that the equipotential surfaces near the tips of the teeth dip deeply into the slots, somewhat as in Fig. 1. This phenomenon is due to the presence of the air-gap. It is the purpose of this article to show how this effect may be allowed for.

For the reluctance of the air-gap of an electric machine an exact solution has been given by Mr. F. W. Carter.[2] He gives a curve in his article for finding the amount of fringe to be added to the width of each tooth, or the amount of each slot that is effective in carrying flux.

The solution desired is easily obtained by combining a uniform field and the field solved by Mr. Carter in the proper proportions by means of the principle of superposition. According to this principle, if two fields separately are in equilibrium, the resultant field is in equilibrium, the potentials and fluxes add algebraically, and the intensities of the field add vectorially.

The field of force in Fig. 1 represents the case to be studied. M_a and M_t are the mmf drops between the tips of the teeth and the armature surface and the roots of the teeth respectively. The total flux per tooth pitch is φ_t. It is to be noted that the mmf consumed in the air-gap is different at a point opposite a tooth from what it is at a point opposite a slot. In Figs. 2 and 3 the field is divided into its two components, the solution for each of which is already known. If the two fields be superposed and the potentials added, it will be seen at once that they are equivalent to the original field. Consequently, the total flux φ_t is the sum of the two component fluxes φ_1 and φ_2.

In Fig. 2 the teeth are supposed to be of the same permeability as the air, so that the field is uniform throughout, and the solution is well known. Thus the outlines of the teeth are shown dotted since they are without influence upon the distribution of the flux. In Fig. 3 the teeth are supposed to be of infinite permeability, and in this case the solution is obtained from Carter's curve. It may seem that contradictory assumptions have been made; however, the following points will show that this is not so. First, the permeability of the teeth is actually intermediate between the two assumptions; second, the numerical relation derived are dependent upon the flux distribution in the air parts only; third, even in the iron parts one would be justified in superposing the two fields provided that he used the value of the ampere-turns for the total real flux density and not for one of its components. The real density can be ascertained from Hobart's curves in the usual way.

The notation here employed will be appreciated by reference to the Figs. 1, 2 and 3 with the additional information that L_g is the gross length of the armature and L_e the effective flux-carrying length. R_a is the reluctance of the air-gap for the space of one tooth pitch. The relations are as follows:

$$M_a - \frac{a}{D}M_t = \Phi_2 R_a = \varphi_t R_a - \varphi_1 R_a \qquad (1)$$

$$\Phi_1 \frac{D}{\mu\lambda L_g} = M_t \qquad (2)$$

Substituting φ_1 from equation 2 into equation 1

$$M_a - \frac{a}{D}M_t = \Phi_t R_a - \frac{M_t}{D}\mu\lambda L_g R_a \qquad (3)$$

The reluctance of the air-gap per tooth pitch R_a is

$$R_a = \frac{K_a a}{\mu\lambda L_g}, \qquad (4)$$

where K_a is the air-gap factor, and $K_a a$ is the apparent air-gap. Substituting for R_a and solving for the total mmf $M = M_a + M_t$,

$$M_a + M_t = \Phi_a \frac{K_a a}{\mu\lambda L_g} + \frac{M_t}{D}[D - K_a a + a]$$

$$= H_a K_a a + H_t[D - (K_a - 1)a]. \qquad (5)$$

wherein H_a is the apparent ampere-turns per centimeter in the air-gap and H_t is the ampere-turns per centimeter in the teeth. While $H_a K_a a$ is not equal to M_a, the mmf used up in the narrowest part of the air-gap, yet since the mmf of the gap is somewhat indefinite, being independent of the tooth saturation, it may be called the mmf of the gap. The remainder of the total mmf may be called the mmf of the teeth, though it is less than M_t. The effect of the slots upon

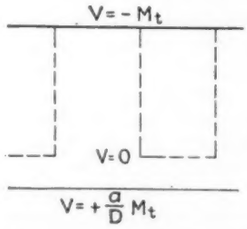


FIG. 2—WHERE TEETH ARE OF SAME PERMEABILITY AS AIR

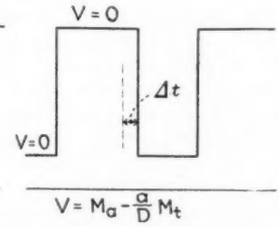


FIG. 3—WHERE TEETH ARE OF INFINITE PERMEABILITY

[1] *Engineering*, Vol. 56, page 130, "Electric Generators." See also Hobart's "Elementary Principles of Continuous Current Dynamo Design," page 47.

[2] *Electrical World*, Vol. 38, Nov. 30, 1901, page 884. See also Hawkins and Wallace, "The Dynamo," fifth edition, Vol. I, page 450.

the air-gap reluctance is the same as though the air-gap were increased by the amount $(K_a - 1)a$, and the effect upon the teeth is as if they were shortened by the same amount.

The air-gap factor K_a is obtained by a simple calculation. If $\triangle t$ is the amount of the slot which is effective in carrying flux, the apparent width of the teeth is $t + \triangle t$, and the reluctance is

$$R_a = [a/\mu L_e\ (t + \triangle t)]$$

On the other hand,

$$R_a = K_a a/\mu\lambda L_g \text{ also.}$$

Hence

$$K_a = \frac{L_g}{L_e}\frac{\lambda}{t + \triangle t}$$

and approximately, $(K_a - 1)\ a = a\,\frac{s - \triangle t}{t + \triangle t}$ (6)

In conclusion, it may be said that if the air-gap ampere-turns be calculated in the usual way the effect of the air-gap reluctance upon the tooth ampere-turns is equivalent to shortening the teeth by the amount $(K_a - 1)a$, and to lengthening the air-gap by the same amount. The mmf of the teeth is to be estimated from curves of real and apparent flux density drawn for the particular grade of iron employed. In this connection it is noteworthy that the grade of iron assumed in Mr. Hobart's book is much better than seems to be obtainable commercially. If his curves are empirical, the discrepancy is explained, in part at least, by the theory developed in this article.

VALUATION REPORT FOR OHIO UTILITIES

Joint Committee Advises Companies on Elements of Value That Constitute the Property

The report of the joint committee on valuation of Ohio Public Utilities has been mentioned previously in these columns. The report was prepared after the issue of an order by the Public Utilities Commission addressed to the companies and requiring the inventory and valuation of properties. Those who formed the committee, which was appointed by the different associations representing the utilities concerned, were as follows: Messrs. Robert Lindsay, chairman, vice-president and general manager Cleveland Electric Illuminating Company; Frank C. Dunbar, district attorney American Telephone & Telegraph Company; Allard Smith, general manager Cleveland Telephone Company; Rollo R. Stevens, Ohio State Telephone Company; J. C. Martin, president Ohio Water Works Association; F. W. Coen, vice-president and general manager Lake Shore Electric Railway, and M. B. Daly, president East Ohio Gas Company. Mr. Andrew P. Martin was secretary for the committee.

In interpreting the intent and scope of the order of the commission the committee says that it is important to remember that the property of a utility comprises both its plant and its business. To the cost of the physical property and the overhead costs must be added the cost of establishing the business and any other elements which enter into the total value of the property.

All property, whether used and useful or not used and useful, is to be included in the inventory and valuation and is to be appraised upon the basis of its reproductive cost as of a certain date. The classification must be based on the operating records and the judgment of the management. Among the five classes of property specifically embraced in used and useful are that class which of necessity may seldom if ever be used but which prudence and good management deem essential as a part of the reserve capacity of the plant and as a safety measure to guarantee constant service, and that class which good management and judgment deem it necessary to acquire in advance of immediate needs.

The cost of reproducing the property of a utility is made up, the committee says, of the cost of reproducing the plant and the cost of reproducing the business which was attached at the time of the investigation.

The outline of the inventory is divided into: (1) Reproduction cost new of preliminary work, physical plant and established business; (2) any other elements of going value or good will; (3) all other elements of value.

The section on unit costs says that the following are the elements which enter into the cost of any unit: Cost of unit f.o.b. point of supply, costs of purchasing and inspection, freight, switching, expressage or cartage to point of delivery or to utility's storeroom or yard, cost of unloading, cost of any work at point of delivery or in shop, storeroom or yard in preparing unit for use, cost of hauling to point of use whenever different from point of delivery, shop, storeroom or yard charges, labor including expenses of transportation, board and incidentals, and foreman's time and expenses in performance of all work at point of use, including lost time and delays in work, tools and appliances, incidental material, breakage, loss and waste, construction superintendence, employees' liability insurance, and public liability insurance. This schedule contemplates that the work will be done by the utility's own organization.

Some of the elements of expense which enter into the cost of reproducing the business are as follows: (1) Cost of organizing and training the operating force and all employees whose work requires skill peculiar to the business of the utility, such as exchange operators, motormen, conductors, dispatchers, roadmen, signal operators, meter readers, installers, linemen, troublemen, and repairmen; (2) cost of organizing the clerical force; (3) cost of organizing and training the selling force; (4) cost of securing customers, including expenses of solicitors, advertising, printing, free wiring or other inducements; (5) cost of commercial engineering; (6) cost of printing all forms, records, books, schedules and directories; (7) rent of commercial offices (where not owned); (8) any cost, not included above, necessary to the development of the business found to exist on the date of the inventory.

The committee believes that depreciation as used in the order may properly be defined as the reduction in value caused by physical deterioration and any present obsolescence or lack of utility if such exists.

The committee objects to the determination of depreciation by the theoretical straight-line or sinking-fund methods and favors the actual inspection method. It concludes that the statute appears to require the adoption of the inspection method. In the opinion of the committee, the depreciation of preliminary and overhead costs, if any exist, at a given time, is so small that it is impracticable to compute it, and the utilities are justified in ignoring it in making up their inventories. The depreciation of contingencies and omissions may be estimated to be the same as the average for the entire physical property.

The committee advises utilities to insert the following on the last sheet of the inventory above the signature: "This inventory and appraisal has been made in an effort to comply in all respects with the commission's order No. 176, by listing the items of property owned by this company and stating their reproduction cost new less depreciation. The company reserves the right, in any appropriate proceedings involving the value of said property or any part thereof, to offer any other or additional evidence of value."

Pole and Tower Transmission Lines

Characteristics of wooden poles—Types of steel towers, their design and advantages—Pleasing outlines and inconspicuousness necessary—Locating a line. By R. D. Coombs

WHILE wooden poles are still the most common form of support for electric circuits, particularly low-voltage lines, they have several objectionable features in that they deteriorate rather rapidly, will not resist fire and are becoming more expensive. Under certain conditions, however, the use of the wooden pole is still economically sound construction even for high-tension lines, although the time is not far distant when wood will be no longer considered for first-class installations.

Characteristics of Wooden Poles

In changing from wood to metal one may profitably pause to consider some of the characteristics of timber poles which have rendered possible the progress in line construction. In theory as well as in fact the wooden pole is a precedent for the metal structure, and a too violent divergence from some of its good features may result in the design of structures not relatively so excellent as the wood they replace. A well-selected timber pole is very nearly ideal for line support owing to the fact that stresses imposed upon it during growth were almost identical in nature with those in pole-line service. It should not be forgotten that a wooden pole has equal strength in all directions, both with and across the line, and in addition has comparatively great strength in torsion. These qualities tend to resist the effect of accidental loads or stresses overlooked in design. Again, wooden poles have considerable elasticity but not complete flexibility, a characteristic which enables them to deflect enough to equalize most unbalanced loadings and oppose forces which might cause damage if added to the existing stresses in other parts of the line. This semi-flexible feature of a wooden pole, which is also obtainable in steel and to a less degree in reinforced concrete, is probably of much greater advantage than is generally realized. The final general characteristic of wooden poles is that they are not easily injured in handling and can be installed by men of ordinary intelligence. Moreover, they contain no long, thin sections which may be bent and rendered useless. That the above good qualities have been largely instrumental in establishing the excellent record of wooden poles in line work cannot be doubted by the analyst.

Steel Poles and Towers

The more permanent types of support may be divided into the rigid wide-base steel tower, the semi-flexible pole (either of steel or reinforced concrete) and the flexible steel pole or frame. Apart from their relative costs for any given line, there is to be considered the ultimate adaptability of each type. Adaptability will involve questions of protective coating, rights-of-way, freedom from serious interruptions to service, and, finally, and to the writer's mind of very considerable importance, the relative prominence given the installation.

Selection of Support

In the progress of a rapidly growing industry there is always a tendency to apply methods of work to sections of the country to which they are less adapted than the locality of their previous successful application. It is injudicious to adopt the so-called windmill tower in the more densely

FIG. 1—FLEXIBLE A-FRAME

FIG. 2—BENDING TEST, CONCRETE POLE

FIG. 3—SEMI-FLEXIBLE POLE

populated regions of the East where the climatic conditions are severe. In such places there are two things to be considered beside cost. These are the undue prominence of the line and the great importance of failures. The windmill tower is rather noticeable, but it provides a type of support which confines failures to practically one span. The flexible frame is not so noticeable, but it has little or no strength in one direction and will therefore presumably be susceptible to damage from less severe stresses. The semi-flexible pole or tower, occupying a position about midway between the two types of structures just mentioned, has at least a theoretical advantage over the others. While some flexibility is useful in a narrow-base structure, in order to permit "pull back" by adjoining span wires, the amount of the movement of the pole top need not be excessive. In actual service heretofore this movement could not have been very great, for the simple reason that the commonly used attachments did not possess sufficient strength to transmit such unbalanced wire tensions. The desideratum is perhaps a certain elasticity rather than extreme flexibility. In fact, a reasonable bending or semi-flexibility is obtainable even in reinforced concrete.

Considerations in Designing Towers

In sparsely settled country or where the right-of-way is for any reason not accessible or not subject to cultivation, the spread of tower bases is unimportant. If more than one high-voltage line is to be placed upon a private right-of-way, the separation of the lines will depend upon factors other than the spread of the bases. When land is valuable the installation of wide-base towers may be impracticable. For instance, it may be necessary to install transmission lines on interurban railway rights-of-way. The development is natural and necessary, but railroad rights-of-way do not provide space for wide-base construction.

Wide-base towers and semi-flexible poles should, when properly designed, provide maximum security against interruptions to service caused by insulator or wire failure. The greater strengths attainable in such structures allow the use of longer spans, with a consequent reduction in the number of insulators. The probabilities of insulator failure are also lessened thereby. Whether due primarily to insulator failure or not, the spread of wire failure along a line is usually arrested before it has had time to influence more than one or two spans.

The relative prominence of various structures in the landscape may prove of considerable subsequent importance. The writer does not mean to imply that a transmission line should be made decorative, but rather that it be made inconspicuous. Even in regard to decorative effect, it is not absolutely necessary that it be an ungainly blot upon the landscape. Some regard to pleasing outlines is not amiss, and most structural engineers realize that a graceful design is also usually economical. If lines situated in settled communities are to remain undisturbed for any considerable period of time, they will have to be either unobjectionable in appearance or invisible.

The design of steel or reinforced-concrete poles and towers is fortunately becoming less hampered by demands for excessive cheapness, and the regulations current in other structural work are no longer entirely disregarded. The wisdom of observing these rules should be apparent when it is considered that a few hundreds or thousands of dollars saved on line construction may jeopardize the efficiency of an investment of mill-

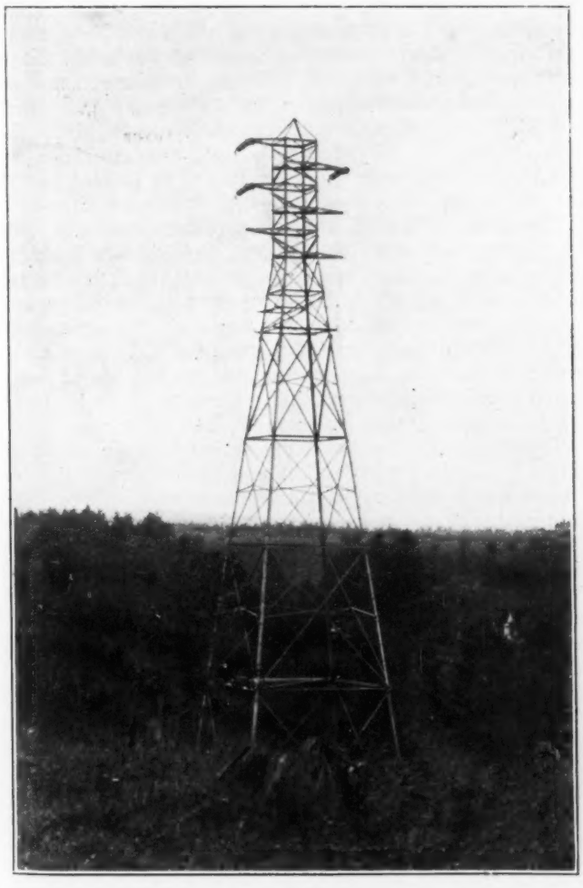


FIG. 4—TOWER OF RIGID TYPE

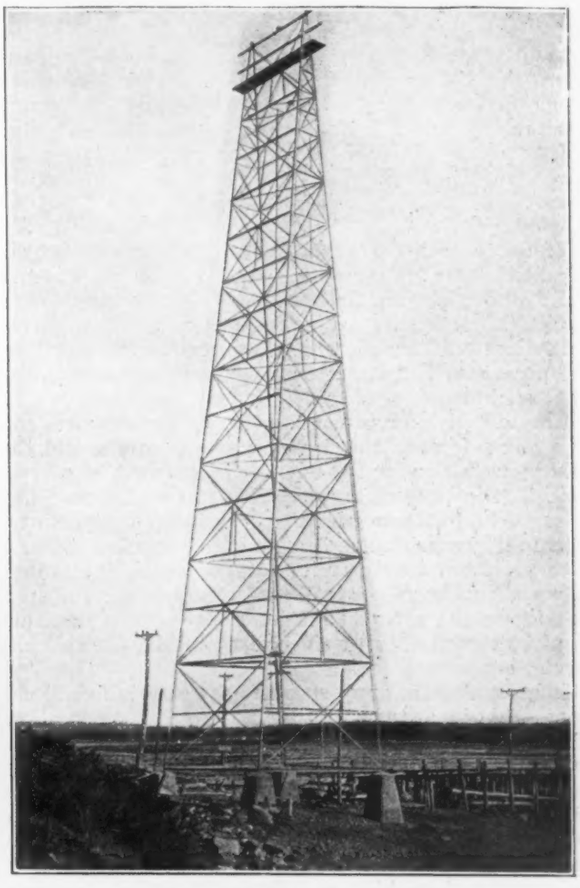


FIG. 5—RIVER-CROSSING TOWER

ions of dollars. It is true that thus far existing construction has given fairly satisfactory service, but it is equally true that the more extended use of faulty designs would eventually bring disrepute upon the industry, and through failures invite the enforcement of severe regulations by various authorities. In any type of support the importance of eliminating long unsupported members and of providing a firm, rigid base is now becoming more generally recognized in the erection of tower lines.

Location Plan and Profile

After the general location of the line has been determined from a study of maps and inspection of the ground, the prompt completion of the location plan is essential. The rate at which this work can be carried on will depend upon whether the line is to occupy, either entirely or in part, a strip of private right-of-way, highways, foreign rights-of-way, or pole rights. In most cases quite accurate preliminary data as to the plan view of the route can be obtained from the right-of-way plans of foreign properties such as those of steam or electric railroads, canals, highways, etc. When a private right-of-way has not been entirely secured, some changes in alignment may be expected, and the location plan is to that extent preliminary. Except for the desirability of a correct permanent record, there is no particular need to determine by accurate survey the exact distance that intervenes between widely separated points.

After the plan has been brought to a semi-final stage, the profile should be drawn upon the same sheet. In plotting the profile considerable future annoyance may be avoided by drawing a true profile and breaking the view at the turns in the line, so that corresponding points will occupy their correct relative position in plan and profile, and both the center line and datum line will remain parallel to the bottom of the drawing. In some cases the distances in the profile have been measured along the inclined surface of the ground and then plotted horizontally, which results in a false profile and compels constant reference to plan and profile to identify a given point in each.

Clearance Over Obstructions

It does not make a particle of difference in the excellence of a given section when completed whether the distance between the corners is 4000 ft. or 4050 ft., but it is important that small steep hills, etc., be correctly located from one end of the section in order that the poles may be placed so as to give proper clearance over the hill.

The tentative, or paper, location of the supports can now be made upon the drawing and scrutinized in the field by walking over the line. It is assumed, of course, that in the preliminary location reasonable care has been taken to avoid natural or artificial obstructions, side hills, swamps, flood lands, or undue interference with private property or its natural use by the owner. Minor changes will always be necessary to fit the paper location to the ground, and local surveys can be made to plot cross-profiles at side hills, crossings, encroachments, etc.

In general, some supports will have certain fixed locations—that is, at turns in the line—so that the locating of other supports is reduced to distributing poles or towers between the fixed points. In a line having many changes of direction and elevation it may be impossible to assume a standard span. The problem is then one of ascertaining the economic or desirable span length for a given series of short sections having fixed ends and various hills or other obstructions between them.

Electrical Development on Pacific Coast

At the recent convention of the Northwest Electric Light and Power Association at Spokane, Wash., the history of electrical development on the Pacific Coast and the opportunities for future growth were brought out in a paper on "Electric Power Development on the Pacific Coast," by Mr. W. E. Herring, of the Puget Sound Traction, Light & Power Company. The author called attention to government reports that 26,736,000 hp is available in this country by utilizing water-power. Of this nearly 43 per cent is available in Washington, Oregon and California. So far as the practical utilization of power is concerned, the author declares these figures too high. Up to the present time 841,000 hp has been developed in hydroelectric plants in these three states. The paper also contained data on the horse-power developed by water and steam in the large Pacific Coast plants and gave an idea of the territory served by each with the capitalization of the organizations. One-fourth of the entire generating capacity of the United States is used west of the Rocky Mountains to serve one-seventeenth of the country's population, which is contributing one-seventh of the aggregate income of the electrical industry. On the average, 527 kw-hr. of energy are consumed per capita per annum, the revenue per capita being $7.50 a year as compared with $3 east of the Rockies.

Silicidized Carbon-Silfrax

At the convention which was held at Niagara Falls this month by the American Electrochemical Society Mr. F. J. Tone, of the Carborundum Company, presented a paper on silicidized carbon-silfrax. When solid carbon is acted upon by vapors of silica or silicon there is formed a silicon-carbide product of the same shape as the original carbon but differing from carborundum in essential characteristics. To distinguish this form of silicidized carbon commercially, it has received the name "silfrax." The properties and characteristics of the product vary with the temperature of formation. If the carbon article is heated in the amorphous zone of a carborundum furnace, the temperature range of this zone being 1550 deg. to 1820 deg., the product is amorphous in appearance, showing no crystals except under high magnification. It has a yellow color and a lusterless fracture. If the carbon is heated in the crystalline zone of the furnace, the temperature of this zone ranging from 1820 deg. to 2220 deg., the material is of great density and plainly crystalline. Upon fracture it shows a steel-black color and a metallic luster.

The depth of the silicidizing action is mainly a function of the time of reaction and the concentration of silicon vapor present in the furnace atmosphere. To obtain the best conversion a large excess of silicon vapor must be present, and the mixture should contain silica largely in excess of the theoretical carborundum mixture. Under regular conditions with articles of pure carbon the maximum penetration is about ½ in. Articles composed of a mixture of carborundum and carbon can be readily converted to a greater depth.

The commercial applications of silfrax are as refractory materials, electrical heating elements and chemical ware. It has all the chemical and heat-resisting properties of carborundum and possesses great density and toughness. Heretofore the articles produced have been of small size. Pyrometer tubes are now made 24 in. in length, but by special furnace construction it will be possible to make much larger sized articles for special refractory vessels and chemical apparatus of various kinds.

Central Station Management

Devoted to Discussion of Administrative Policies, Commercial Methods and Current Practice Among Successful Utilities

Simple Window Display Carries Helpful Suggestion

In a window display recently arranged in the office of the Noblesville (Ind.) Heat, Light & Power Company the only "properties" needed were an art-glass portable table lamp, a few school books and a placard. Simple sentences on the card pointed out the fact that the resumption of studies called for efficient home lighting so that the children might not harm their eyes. The rays from the reading lamp falling on the books in the otherwise darkened window attracted the attention of many passing parents who wished to encourage their offspring to spend industrious evenings at home while at the same time they recognized the grave injury often done to the pupil's eyesight because of bad lighting.

"Electric Light Is Safer"

The Kansas City (Mo.) Electric Light Company is taking timely advantage of the national safety-first movement to point out through newspaper advertisements the dangers of using exposed-flame illuminants and to recommend electric lamps as far safer. One of the advertisements, conceived in humorous vein, represents a man falling down stairs with a broken oil lamp in flames on the floor below. Beneath the picture is the legend "Electric light is safer," and on a disk bearing the outline of an incandescent lamp bulb are the words "Safety first."

Accounting Methods for Stockrooms

As one of the greatest sources of loss to a company is in the storeroom, it is highly important that proper accounting methods be provided for that department as well as others. In Mr. Edward A. West's paper on "Balance of Stores System," read before the late convention of the Northwest Electric Light and Power Association, was described the method of handling, accounting and issuing of stores used by the Portland Railway, Light & Power Company. In brief, this system consists of keeping records of stock on hand, on order, apportioned, available and issued. In addition, the records show the maximum and minimum amounts to be kept in stock and indicate the consumption of each item during any period. The system of symbols employed shows where the materials are located in the storerooms. The author divided stock into three classes—classified, unclassified and idle equipment. He also described the methods of ordering, purchasing, receiving, replenishing, transferring and returning materials. Stock-issue requisitions, credit memoranda, bin cards, balance cards, purchase orders, invoice forms, material slips, check-balance sheets and requisitions on purchasing department were described and illustrated. The operations of each department having business relating to the storeroom were also described. The stores record can be used to answer the purpose of price cards and also take the place of purchasing records.

Prosperous Electric-Vehicle Garage at Danville, Ill.

Danville, Ill., with a population of only 40,000 inhabitants, is supporting a garage for electric vehicles exclusively, and the proprietors and operators of the enterprise are enjoying a profitable and continually increasing business. The Linne Electric Garage, taking its name from the owners, Messrs. Harry A. Linne and H. E. Linne, furnishes service to about fifty-five regular customers. There are in all about sixty electric pleasure cars and no trucks in Danville. In addition to its electric-vehicle clientele a number of owners of gasoline automobiles are regular patrons, knowing that the Linne garage specializes in electrical charging and equipment. All work done on these gas cars, though, is of a purely electrical nature, no attempt having been made to care for gas-engine troubles. It is explained that the owners of gasoline cars, coming from a radius

INTERIOR OF ELECTRIC-VEHICLE GARAGE ESTABLISHED IN A CITY OF 40,000 PEOPLE

of 40 miles, supply about 25 per cent of the gross business of the company, the remaining 75 per cent being due to vehicles driven by electric energy.

Rates for garaging electric vehicles at Danville are quite reasonable, $25 a month being the standard charge for energy, washing, care of tire troubles, and delivering. Some of the customers elect not to make use of the full service, and for their convenience other rates are made ranging down to $5 a month for dead storage. All charging of cars is done as the cars stand at their stalls; as many as twenty-five batteries can receive energy simultaneously if desirable. A 110-220-volt direct-current service from the lines of the Danville Street Railway & Light Company makes the use of rectifiers and motor-generator sets unnecessary, the energy being distributed from a single panelboard to the individual service outlets in the concrete wall. In addition to its garaging business the Linne Electric Garage also holds the agency for electric automobiles in Danville.

Protection for Farm-Line Transformers

Early in its present successful rural-customer campaign the Noblesville (Ind.) Heat, Light & Power Company found that some sort of renewable fused cutout must be developed to protect the farmers' transformers. The design which has been universally adopted for all of the company's lines is shown in the accompanying sketch. Copper wire, a piece of broom handle and a light fuse wire are the only materials employed in its construction. The broom handle is cut to a convenient length, approximately 1 ft., and five gimlet holes are bored through it as indicated by the dotted lines. In the end holes No. 8 copper wires are fitted, and one protruding end of each wire is then fashioned into a hook. The other ends of these wires extending upward and outward are used as the supports about which the fuse wire is wrapped. No soldered joints are employed.

Of course the rural customer's transformer installation must be designed to receive this cutout, and pri-

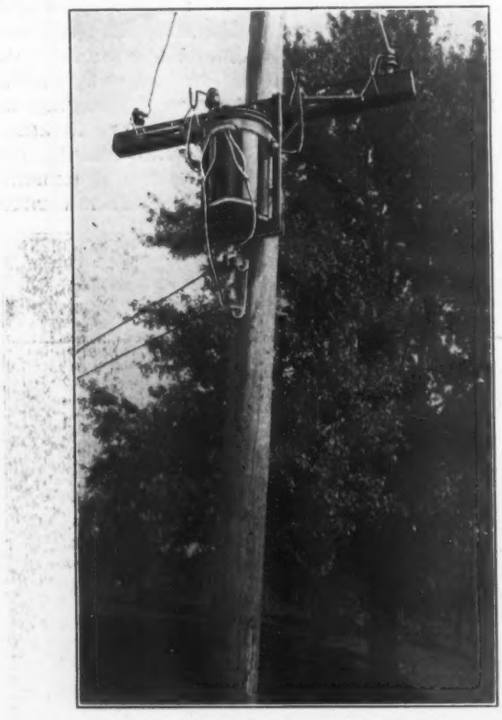


FIG. 1—RURAL TRANSFORMER INSTALLATION, SHOWING BROOMSTICK CUTOUTS

marily it is important that the transformer itself be hung near the ground. In most cases a clearance of 8 ft. is left beneath the bottom of the transformer. The primary leads are then dropped from the main line to the outside pins of the secondary cross-arm, and the end of the high-tension wire, after being wrapped around the insulator, is bared and fashioned into a hook similar to those carried by the cutout. On the inside pins other hooks are fastened and connected to the high-tension leads of the transformer. When the secondary lines from the transformer have been carried into the house and the inside wiring has been completed, the installation is placed in service by hanging two of the fused cutouts on the hooks extending from the secondary cross-arm. If lightning or an overload makes it necessary to renew a fuse, the cutout can be lifted from its position by means of a spiked or forked pole in the hands of the customer on the ground. All patrons of the company are taught this simple operation by the company's linemen.

Mr. John T. Kester, manager of the Noblesville company, states that the use of these devices has saved many transformers, and he believes that the rural populace, as a rule, is careful in handling the cutouts when renewing the fuses. Most of the company's primary

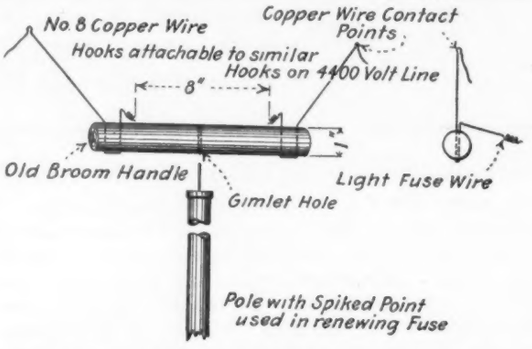
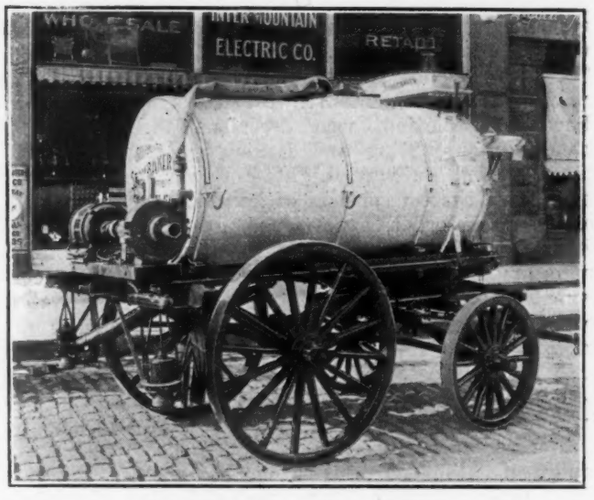

No. 8 Copper Wire
Copper Wire Contact Points
Hooks attachable to similar Hooks on 4400 Volt Line
8"
Old Broom Handle
Light Fuse Wire
Gimlet Hole
Pole with Spiked Point used in renewing Fuse

FIG. 2—CUTOUT WITH REMOVABLE FUSE DEVELOPED FOR FARM SERVICE

lines operate at 4400 volts, and the contact between the hooks, although scarcely more than a point, is sufficient for the small current flowing at this high potential.

Central-Station Energy for Filling Sprinkler Tank

The electric plant at Springville, Utah, makes a peculiar use of its distribution lines extending along the public highways in the vicinity of the city. A portable pumping plant attached to the rear end of the city's new road sprinkler is employed to fill the water tank from wayside irrigation ditches (of which there are many). The pumping apparatus consists of a 1.5-in. Worthington centrifugal pump directly connected to a 3-hp, three-phase Westinghouse induction motor operating at 1700 r.p.m. When the sprinkler tank has to be filled the wagon is drawn up at a place where an irrigation ditch and electric-service wires are available. The suction pipe of the pump is then dropped in the ditch and the motor connected to the distribution circuit by a flexible conductor. This pumping equipment takes the place of the several isolated pumping stations for-



SPRINKLER TANK FILLED BY ELECTRICAL PUMPING

merly used and eliminates the necessity of investing money in elevated storage tanks. The electrical equipment was installed on the wagon by the Inter-Mountain Electric Company.

Illumination and Wiring

"White-Way" Posts Painted for 55 Cents Apiece

Under the direction of the South Park Commissioners, Chicago, the 12-ft. by 5-in. single-lamp ornamental lighting posts along ten miles of boulevards have been painted, greatly enhancing the beauty of the standards. The work is being done by a local painter at a contract price of 55 cents a post. Each standard is wire-brushed and receives a coat of red lead and a second coat of black, producing a smooth and attractive finish. A complete description of the lighting system of which these posts are a part was published in the *Electrical World*, July 11, 1914.

Star-Spangled-Banner Centennial at Baltimore

BY ROSCOE SCOTT

The one hundredth anniversary of Key's writing of "The Star-Spangled Banner" was made the occasion of a city jubilee in Baltimore during the week beginning Sept. 21. Incidentally the illumination of the city's public buildings and monuments during the celebration presented certain features that were strikingly successful. The original flag that stirred Key to the writing of his famous song was kept flying at Fort McHenry, and at night the historic old banner was illuminated by two 500-watt stereopticon-type tungsten-filament lamps in projectors.

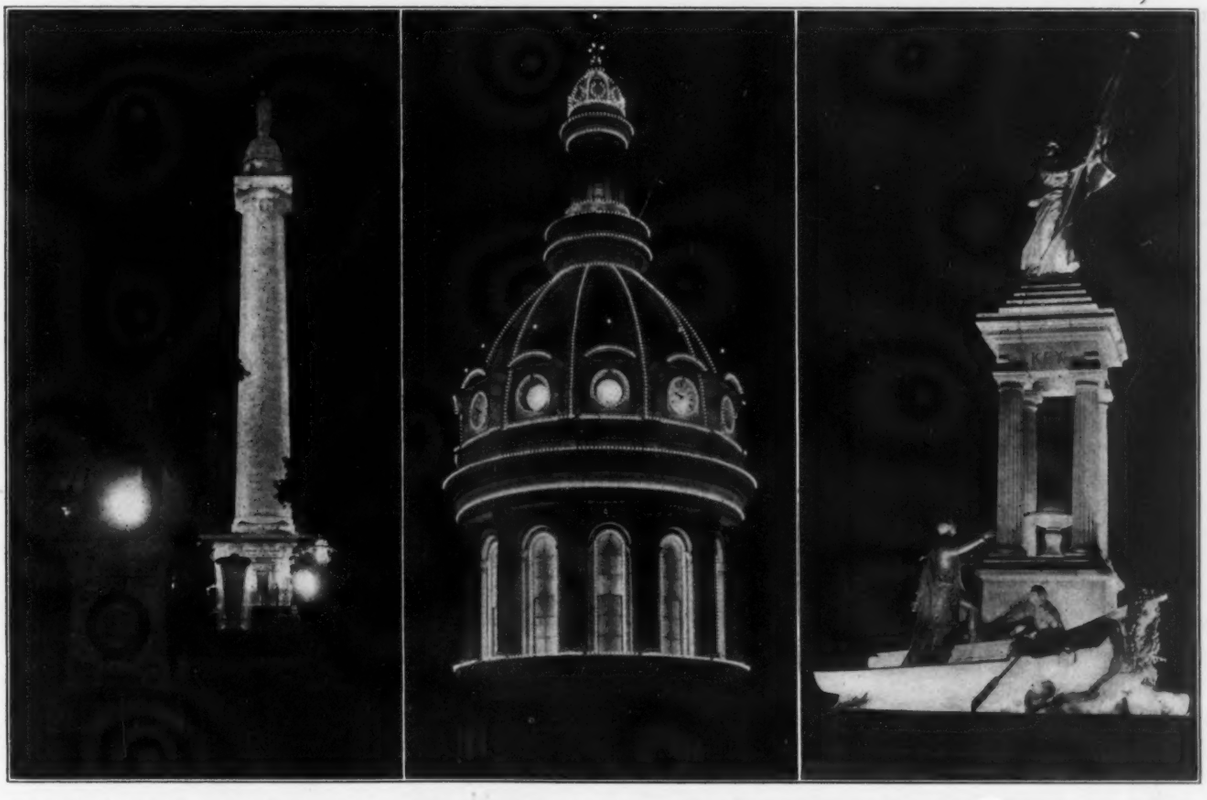
One of the best known of Baltimore's many landmarks is the George Washington Monument on Calvert Street. During "Star-Spangled-Banner Week" this shaft was illuminated by four 1000-watt stereopticon-type tungsten-filament lamps, temporarily installed on the roofs of four buildings, supplemented by four 400-watt lamps near the base, the light from which was projected upward on to the column by angle steel reflectors.

One feature that is not evident in the illustration deserves mention. There are eight large urns, two at each entrance to the monument, and in these urns were placed red-bulb lamps, as well as certain chemicals reacting continuously to produce smoke. The red light playing on the particles of smoke produced a singular "incense" effect that was as gratifyingly successful as it was daring in its conception.

Particular interest centered around the Francis Scott Key monument. Here, again, flood-lighting was employed to "snap out" the statue against the black background of the sky. Four 400-watt tungsten-filament lamps in angle-steel reflectors produced the result shown in the picture. When the lighting was first tested there was a particularly dense and objectionable shadow under the chin of the uppermost figure, but this was later eliminated by localized lighting, a small lamp being placed in a concealed position on the statue itself.

Some experimenting was also necessary before the effect shown in the photograph of the City Hall dome was secured. The dome was first outlined with 3500 15-watt tungsten-filament lamps, but the appearance at a distance was too conventional and failed to reveal the architecture of the dome. Accordingly, the outline lighting was supplemented by flood-lighting from twelve 1000-watt lamps. To the lay eye the lighting appears to come entirely from the small lamps on the dome.

With the exception of the City Hall dome lighting, which was installed under the direction of Mr. James Baggett, of the Baltimore Lamps and Lighting Department, all of the above-mentioned electrical work was carried out under the supervision of Mr. J. Harry Gross, of the Baltimore Park Board. Mr. V. M. Yates, of the Colonial Electric Division, Warren, Ohio, gave valuable advice and assistance in the special lighting effects. All lamps and equipment were furnished by the Baltimore Electrical Supply Company.



FIGS. 1, 2 AND 3—ILLUMINATION OF WASHINGTON COLUMN, CITY HALL DOME AND FRANCIS SCOTT KEY MONUMENT AT BALTIMORE CELEBRATION

Sealed Sectional Service Board

In certain cases it is a disadvantage to have the entire service board for a building a unit structure, as building owners expect electric-service companies to furnish this apparatus free of cost on the theory that it is necessary to the delivery of energy. Under such circumstances the expense of the apparatus is an important item and it becomes desirable to differentiate between the parts which the central station may be properly called upon to furnish and the parts which the building owner should furnish.

To reduce difficulties of this nature to a minimum Mr. Nels Joleen, of the Commonwealth Edison Company, Chicago, has invented a sectional service board constructed so that the central-station company may supply the lower section shown in the illustration herewith and the building owners may supply as many other sections as tenants demand from time to time. As will be seen from the drawing, the base section consists of an insulating panel carrying incoming lead connections, a switch and fuses inclosed in a metal cabinet. The upper sections contain busbars, fuses and customers' connections.

In practice the lower section is installed by the power company and electrical connection is made between the main switch and the service conductors. Before leaving the premises the company's representative closes the top of the base section and seals the front door. Busbars in the base section are then alive, but no access can be had to them without detection. When the house wiring has been completed and tenants are ready for electric service the company's representative has only to remove the partition between the lower and second sections and insert the three short strips of busbar; then the installation is complete.

This type of apparatus has the further advantages of preventing electricians from using free electrical energy during the time they are wiring a building and of permitting future extension.

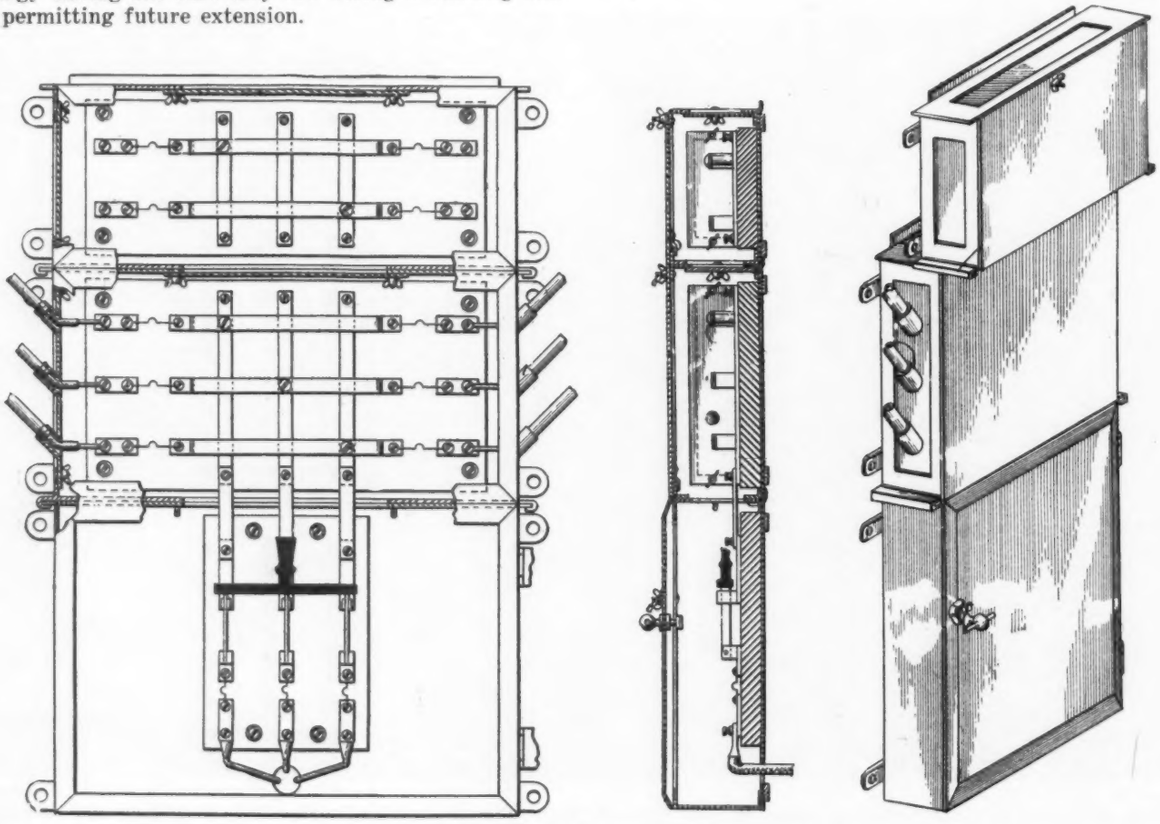
Musical House Buys Mammoth Electric Sign

An electric sign that is one of the largest in Chicago has been in operation to advertise the goods of Lyon & Healy, manufacturers and dealers in musical instruments. Measuring 68 ft. wide and 40 ft. high and carrying approximately 4000 5-watt and 10-watt tungsten lamps, this sign stands at the corner of Park Row and Michigan Avenue within full view of persons on the latter street for about 1.5 miles. The steel work supporting the sign on the buildings at this corner weighs 23 tons.

The border of the sign simulates a lyre within which a Confederate and a Northern soldier are marching side by side, one with a drum and one with a horn. Out of the horn the words "Marching 50 Years" are blown by the soldier, this expression being appropriate since the firm has been in business for fifty years. In addition to these flashing words there is a changeable-letter feature within the sign to allow different departments of the company's business to be exploited. Both the sign and the 15-ft. flasher used to operate it were built by the Thomas Cusack Company, Chicago.

Series-Relay Protection Against Overloads with Crane Motor Circuits

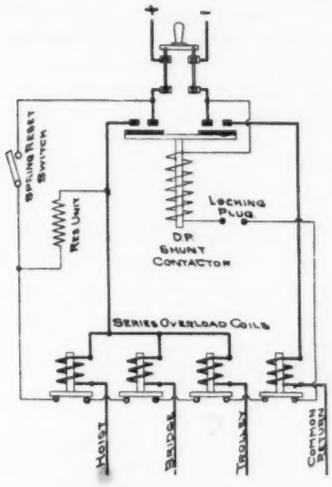
The accompanying diagram shows one of the simplest methods of connecting series relays to protect crane motors from overloads and feeders from grounds. In the positive feeder to each motor and in the common negative return feeder is a series overload relay all of whose contacts are connected in series with the main circuit-breaker solenoid across the terminals of the supply switch. If any motor is overloaded, the positive feeder grounded in the plant or the negative feeder on the



FIGS. 1 TO 3—VIEWS OF SECTIONAL SERVICE BOARD

crane, one of the relay contacts will open, de-energizing the shunt contactor, which in turn opens the main circuit. The circuit will also be interrupted if the voltage drops low enough to de-energize the shunt contactor. By closing the spring reset switch after the circuit is broken the main-circuit contactor will be closed if the conditions are correct. On releasing the reset switch the contactor will be held closed by current flowing through the resistance shown in the diagram.

This method of connecting series relays so as to



RELAY CONNECTION FOR PROTECTING CRANE MOTOR

provide protection for crane motor circuits was suggested in a paper presented by Mr. Stewart C. Coey at the convention of the Association of Iron and Steel Electrical Engineers held recently at Cleveland, Ohio.

Letter to the Editors

The Cost Theory of Rate-Making

To the Editors of the Electrical World:

SIRS: It is apparently not understood that the people who have been attempting to impress on the rate-makers the importance of the value of the service also believe just as strongly, if not more strongly, in the importance of the cost of the service.

The objections to the rates that claim to be based only on costs are not to the cost theory itself but to such dangerous assumptions as that the cost per kilowatt-hour is always the same or that the cost may be computed from certain formulas. It is not to the cost theory that objection is made, but to particular methods of calculating costs.

The cost theory itself is right and may be said to form the foundation of all rates, and the value theory is used only when costs alone fail to give rates most advantageous to the public. This may be brought out most easily by seeing how motor service and lighting rates are made. For the sake of simplicity we will assume that power and light are not used at the same time, but that the motors are used in the daytime and the lamps at night time. A certain amount of expense is involved by each kilowatt-hour used, this being chiefly for coal. Such expense is obviously part of the cost of either the energy for motors or that for lamps, and must form part of the rate. In addition, there are all the expenses for installation and maintenance of the plant, which go on whether the plant is used or not. Some of these depend on the maximum demand on the plant, but there are others, as, for instance, the cost of digging a conduit, which are practically independent of whether 1 kw or 1000 kw is intended to be the maximum load.

If only the lamps are used, lighting must stand all these costs; if only the motors are used, motor service must stand all these costs. So far the cost theory is absolutely right. When, however, both the lamps and the motors are used, these costs are not increased, and if the rates are made the same as when only the motors or only the lamps are used the central-station income will be much above costs.

Hence when joint use is made of the same equipment by two different customers or classes the rates to each must be below what the cost and rates would be if either alone used the service.

The joint costs may be divided in all sorts of ways, as per kilowatt-hour, per lamp-hour, etc. When the joint costs are small they are often divided by adding a percentage for overhead or general expense to the direct costs.

Obviously, the greater the number of users served without increasing the joint costs, the less will be the burden on each user. If an attempt is made to charge any prospective user more than he can get the service for otherwise, he will not take advantage of the offer, and consequently will not become a contributor to the joint costs.

Hence, if after establishing the rates by the cost theory any part of the investment is unutilized, any additional user who really cannot afford to pay the rates established on the cost basis should be permitted to use the idle plant and make some contribution to the joint costs. No matter how little he contributes, he reduces the share of the others.

However, since he is to pay less than the other users pay, he should be made to pay all that he can afford so that he may have no greater advantage in competing with the first customers than if he secured the equivalent service by other means.

The above is all the value-of-service theory amounts to. The value theory does not dictate the charging of all the traffic will bear, but suggests making each and every rate as low as possible consistent with the costs. The value theory is based on the initial assumption that the total rates must be equal to and *no more* than the total costs, and involves reducing all rates to the minimum by getting more customers to share in the joint costs.

In considering any rates the idea of value need not be introduced until the total rates are made equal to the total costs. The idea of value may then be applied in two ways. First, no customer should be allowed to pay too little. Second, when any part of the plant or expense is unutilized and customers who would pay something toward joint costs are failing to use it because the price asked is too high, then it is better to have them pay something—that is, pay the value to them and reduce the rates to the others—than it is to have the plant idle.

According to the cost theory, the prices are dependent on the number of customers that can be secured. Other customers obtained in accordance with the value theory make the prices lower still, and yet since none of those who get low prices should (if the value theory is followed) get any lower price than they would pay for equivalent service elsewhere, the low prices give them no advantage that they would not have anyway. The value theory makes the actual rates always as low as, and usually very considerably lower than, the cost theory makes them.

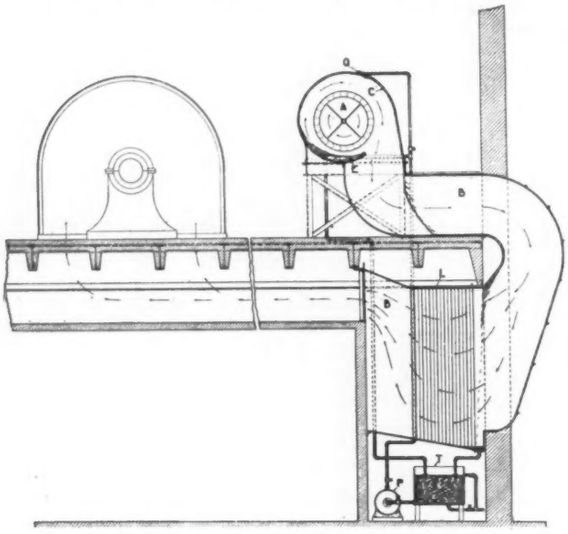
Lynn, Mass. WILLIAM ADAMS.

Field of the Operating Engineer

A Record of Practice, Experience, New Ideas and Interesting Problems—Notes on Practical Subjects—Questions and Answers

Ventilating Turbo-Generators and Transformers with Washed and Cooled Air

Apparatus for washing, cooling and drying the air-ventilating turbo-generators at the Gold Street station of the Brooklyn (N. Y.) Edison company is shown in the accompanying diagram. Air leaving the blower



AIR WASHER FOR 22,000-KW TURBO-GENERATOR

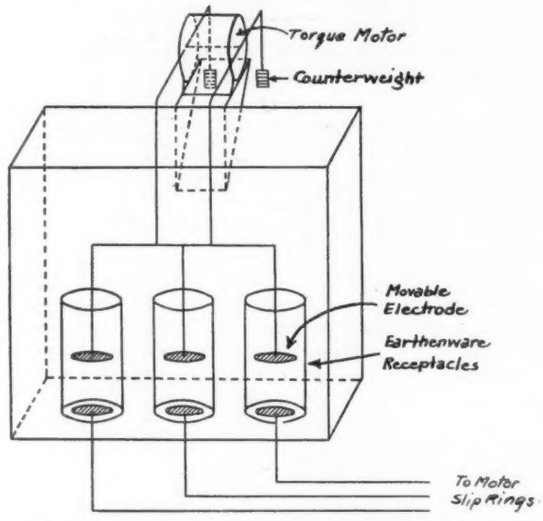
blades *A* at high velocity picks up water from the pool *E* in the bottom of the fan casing and forces it to flow around the casing *C* and along the walls of the duct leading to the generators. Additional water is supplied at the top of the fan case *O* through a perforated pipe. Any dust or solid matter which may be present in the air when thrown against the film of water maintained on the walls of the air duct will be entrapped thereby and conveyed to a settling tank below the air drier *L*. The water on its way to the tank falls across the duct just below the fan and at the entrance to the drier, thus presenting a thin sheet of spray to the passing air, which is cooled and also cleansed by contact therewith. The drier consists of a number of sheet-metal baffles which separate the water from the air by subjecting it to several sharp changes in direction. The clean, dry air is delivered from the drier direct to the duct leading to the generators. A small centrifugal pump *P* draws water from the tank *T* and delivers it to pool *E* and perforated pipe *O*. Similar apparatus is employed at the Thirty-ninth Street substation of the New York Edison Company for supplying cool, clean, dry air to transformers.

Protect the Eyes from Flashes When Opening Switches

Careless switchboard attendants have had their sight impaired by failing to turn their heads away from switchboards when opening a switch carrying a large current. When it is necessary to open a switch under these conditions the operator should protect his hands with gloves and should turn his head and eyes away from the switch to avoid being injured by any possible flash. The ocular strain caused by witnessing an arc at close range may sometimes cause permanent eye weakness and a burn from an electric flash is generally slow in healing.

Automatic Motor Acceleration with Liquid Rheostat

A wound-rotor induction motor can be automatically accelerated if its secondary terminals are connected to a variable-resistance liquid rheostat the position of whose electrodes is regulated by an auxiliary motor in series with the main motor's supply circuit. The accompanying diagram represents a method of accomplishing this result. The movable electrodes are electrically and mechanically connected and supported by a counterweighted lever fastened to the auxiliary motor's shaft. This motor should be connected so that it tends to raise the electrodes when the primary current of the main motor increases. With full-load current flowing, the torque of the rheostat motor plus that caused by the counterweight should be sufficient to balance the electrodes. Any increase or decrease in the current should cause them to separate or approach each other respectively. By limiting the downward motion of the electrodes the full-load speed of the motor can be maintained at any desired value. Used with a motor



AUTOMATIC MOTOR-OPERATED LIQUID RHEOSTAT

equipped with a flywheel to carry short peak loads this apparatus will prevent excessive current flows and permit using a motor rated at the average load which it has to carry. This method of speed control was described by Messrs. Wilfred Sykes and G. E. Stolz at the Association of Iron and Steel Electrical Engineers' convention held recently at Cleveland, Ohio.

Detecting Defective Insulators

On the system of the Puget Sound Traction, Light & Power Company, of Seattle, Wash., Mr. M. T. Crawford, in charge of the transmission lines, has devised a convenient and rapid means for detecting defective insulators. The scheme was outlined briefly at the Pacific Coast meeting of the A. I. E. E. in Spokane, Wash. Recently the porcelain pin insulators used on one of the company's lines began to give a great deal of trouble. Investigation showed that the insulators do not usually have a large radial crack, but that a small crack starts on the head or in the side groove and extends around on the top of the insulator. These cracks enlarge until a leakage current starts through the top two or three shells and discharges over the surface of the lower shell. The tendency of a brush discharge to pass in the positive direction more than in the negative has a rectifying effect on the leakage current. This results in a unidirectional current from the bottom shell to the pin, and signs of electrolytic corrosion of the pinhead in the cement have frequently been found. Once started, this will soon crack the entire insulator, as the high tensile stress put on the porcelain by this internal expansion will lower its dielectric strength. In many cases insulators have been found which were leaking noisily, and when the line was killed and an examination made the insulator was found intact, although a number of cracks were visible. As soon as the tie wire was removed, however, the entire insulator fell apart.

The expense of replacing all of the insulators was prohibitive, and the practice heretofore was to replace them one by one when the leakage became so great that it could be heard from the ground. As they were at an advanced stage of deterioration before this condition was reached, and frequently failed, causing an arcing ground that punctured other insulators, a heavy charge against maintenance resulted because of the emergency nature of the repair work. In locating defective insulators at first, use was made of a megger, but unless the testing wire was over the leaking crack and this crack extended clear through to the pin, the result was unsatisfactory. After considerable experimenting, a device was perfected by which these insulators could be located at an early stage of the depreciating process. This enabled them to be replaced economically and before they finally broke down and damaged other insulators or interrupted service.

The device used for this purpose is shown herewith. It consists of a pair of 2000-ohm wireless-telegraph receivers fitted up for the convenience and safety of the inspector in testing. A hand pick is driven into the pole about 7 ft. from the ground, and a pin is driven into the ground several feet from the pole. The receiver set is connected between these two, and if all insulators are sound, there is a clear audible sum of the same tone as the telegraph line due to the shunting of a part of the capacity current of the insulators on the pole top. If, however, an insulator is leaking, a scratching noise is superimposed on the hum which comes and goes as the neutral shifts to and from the wire on the defective insulator. The inspector then climbs the pole and tests between each insulator pin and the center of the cross-arm and thus locates the defective insulator. The device can be used in a similar manner on steel tower lines. Insulators can be found in this way which have only a very small crack started and which will not puncture on the

FIG. 1—TESTING LINE FOR DEFECTIVE INSULATORS

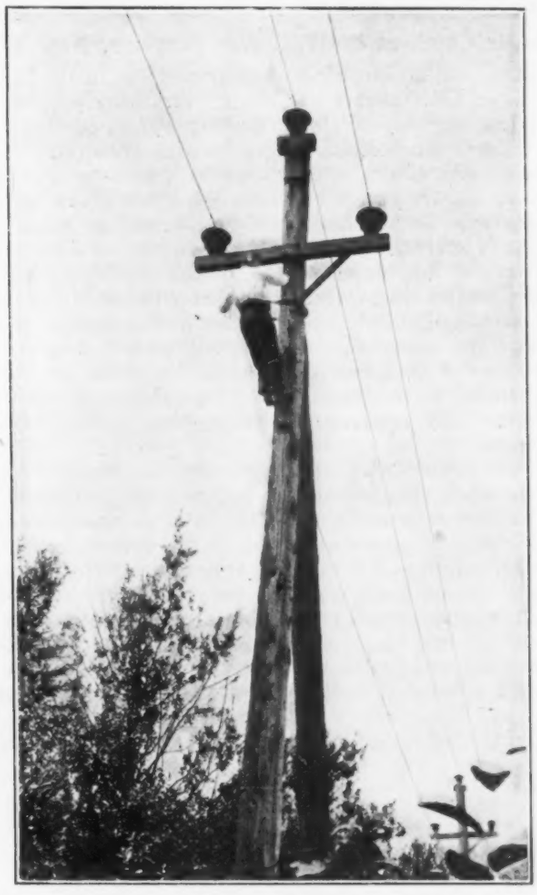


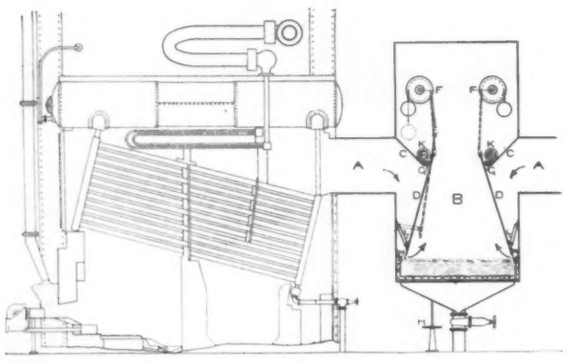
FIG. 2—LOCATING DEFECTIVE INSULATOR

test below 100,000 volts. Insulators with a crack clear around the head were taken off and tested, puncturing at from 60,000 volts to 65,000 volts, but no sound was audible from them while on the line without the use of the detecting set. One or two lower petticoats were usually found intact, the leakage current passing over their surface during the test until the puncture point was reached. In the device used on the Puget Sound lines the hand pick consists of an insulated tube with a sharp-pointed steel terminal on one end which is thrust into the pole or cross-arm. The other terminal, which is driven into the ground or in the pole under the cross-arm in locating the insulator, consists of a sharp steel pin. A fuse and short-circuiting jack with plug on the receiver set is inserted in the circuit if there is any probability of a considerable voltage to ground.

Cinder Catchers at Waterside Stations, New York

Many of the electric-service companies in the larger cities of this country are doing everything possible to eliminate smoke and cinder discharge from power-house chimneys. The accompanying drawing shows the cross-section of a cinder catcher used with back-to-back boilers at the Waterside station of the New York Edison Company. *B* is a horizontal flue extending along the backs of several boilers. Smoke entering at *AA* strikes baffles *CC* and dampers *DD*, which cause it to flow downward to *MM*, where it is sharply deflected and loses its entrained cinders in the water at the bottom of the tank. The dampers *DD* are movable so that they can be lowered for light loads and raised for full loads. They are supported by drums *FF* with chains and counterweights. By rotating *FF* the opening at *MM* can be changed.

Considerable solid material is also removed from the gases when they strike the dampers by the sheets of water flowing over them. The water is used over and over again by pumping it out of the bottom back into perforated pipes *KK* with a low-head centrifugal pump. About 75 gal. a minute per boiler is circulated over the dampers and about 8 gal. a minute per boiler is added to make up for evaporation and for the water-spray which is carried away with the gases. The faster the gases pass downward toward the pool of water the more cinders will be removed. It is estimated that in this installation the entrained cinders and ashes are projected toward the water with a velocity of about 50 ft. per second.



DESIGN OF CINDER CATCHERS

As considerable sulphur-dioxide gas is present in the smoke the water is gradually acidified, and the tank had to be protected against corrosion. It has been found that the best material for the baffles and bottom of the tank is cinder concrete. The baffles are stiffened with expanded metal. They may also be made of cypress lumber, as it is unaffected by acid and will stand heat as long as water is kept flowing over its surface. Tests made on the flue gas under ordinary conditions without the cinder catchers have shown that the smoke contains ashes and cinders amounting to 1 per cent or 2 per cent of the weight of the coal fired. With the cinder catcher operating about 95 per cent of the solid matter is removed.

A Turbo-Exciter Safeguard

As a safety measure a Michigan generating station has covered the open end of an exciter situated on the end of a 7500-kva turbine shaft with a circular piece of asbestos board. This insulating material, held in place by three machine screws, prevents employees or occasional visitors from touching live parts of the commutator or brush holders. Although the potential of these parts is admittedly low, there is possible danger, and it was deemed wise to guard against it.

Braking Induction Motors by Reversing Primary Connections

According to a paper presented by Messrs. Wilfred Sykes and G. E. Stolz at the recent convention of the Association of Iron and Steel Electrical Engineers, one of the most satisfactory methods of braking a wound-rotor induction motor is to reverse its primary connections. As this will induce double voltage and frequency in the secondary circuit, it is essential that the insulation be capable of withstanding the increase. Moreover, the resistance connected across the slip-rings should limit the current to a safe value. If the ordinary starting resistance will not do this, an auxiliary resistance may be connected permanently in series with it and shunted when the motor is being accelerated. The allowable current will depend on the design of the motor and to a great extent on the disturbing effect which the braking current will have on the rest of the system. The simplicity of control for this method of braking will generally warrant the added expense of extra insulation on the secondary windings.

Steam Versus Electrically Driven Auxiliaries

What is considered to be the best practice in driving the auxiliary machines in power houses? Are electrically driven auxiliaries making much headway against the steam-driven machines?
H. P. P.

Many of the best engineers of the country hold that electrically driven boiler-feed-water pumps, air pumps, exciters and circulating-water pumps are not advisable in a power plant from any point of view, as they form a link in the chain and any one of these links may be the means of shutting down the entire system. Investment, thermal efficiency and reliability all indicate steam-driven auxiliaries for power plants. There is a tendency, however, to install electrically driven apparatus for regular operation with duplicate steam-driven apparatus in reserve. This does not apply to all the auxiliary machines. The feed-water pumps and others in the more modern stations are usually driven by small steam turbines, the exhaust from which is used in heating the feed water. Motor-generator sets are used for supplying excitation to the main generators, turbine-driven exciters being held in reserve. The circulating-water pumps are also sometimes electrically driven. By and large, the auxiliary machines in power stations are steam-driven.

Digest of Current Electrical Literature

Abstracts of Important Original Articles Appearing in the Periodical Electrical Press of the World

Generators, Motors and Transformers

Bearing Currents.—E. G. MERRICK.—An article illustrated by diagrams on the destructive effect of currents in bearings. The author's analysis shows that where the number of poles is a multiple of twice the number of joints an electromotive force may be expected to occur in the shaft. If the number of poles is not a multiple of twice the number of joints, the joints will be evenly distributed between the two flux circuits; therefore there will be no variation in flux around the shaft and consequently no electromotive force induced in it. These conclusions are based on a symmetrical distribution of the frame joints. Mechanical considerations, however, sometimes require an unsymmetrical arrangement of the joints, and this, under certain conditions, may be such as to reverse the rules just stated. As regards the generation of shaft currents, the only difference between machines in which the field is produced by direct current and those in which the field is produced by alternating current lies in the fact that in the former type a shaft electromotive force can be generated only when the machine is running, whereas in the latter type an electromotive force is present whether the machine is running or at rest, its magnitude depending on the relative values of the stator fluxes for the standing and running conditions. Induction motors are especially susceptible to the effect of unsymmetrical conditions in their magnetic circuits. One method of preventing damage due to bearing currents is as follows: Brushes are placed on both ends of the shaft and are either grounded on the bearing pedestals or connected together by a heavy copper conductor. The result in either case is to shunt more or less of the shaft current through this path and thus reduce the amount passing between the shaft and bearings. The protection thereby afforded is uncertain. A second method is as follows: In the case of horizontal machines insulation is inserted between one or more of the bearing pedestals and the machine base, the number of points at which the circuit is to be broken depending on the number of bearings and the number and type of machines mounted on the same shaft. This method applied to vertical machines necessitates the placing of insulation between the upper bearing bracket and the armature spider and the insulating of holding-down bolts. In addition it is, of course, necessary to insulate all piping, stairs, hand-rails, etc., which would otherwise complete the electrical circuit. This method, if properly applied, provides an absolute protection.—*Gen. Elec. Rev.*, October, 1914.

Three-Phase Commutator Motor. — An illustrated English translation in abstract of the German article by H. K. Schrage, noticed some time ago in the *Digest*, on a three-phase commutator motor with shunt regulation by brush displacement, built by a Swedish company. —London *Elec. Review*, Sept. 25, 1914.

Lamps and Lighting

Manufacture of Tungsten Wire.—A note on a recent British patent (No. 20,122, 1913) of C. Gladitz for a method of making tungsten wire of uniform tensile strength. The wire is cold-drawn, and the cross-section is reduced approximately 20 per cent by each drawing operation. When the original cross-section has been reduced by about 50 per cent, the wire is wound on bobbins and is annealed by being passed through a heating chamber in an atmosphere of inert gas, where the temperature is gradually raised from 250 deg. to 400 deg. C. and then gradually reduced to its initial value. The bobbins are placed on a conveyor belt which carries them at the required speed from one end of the furnace to the other, thus insuring uniform treatment.—London *Elec. Eng'ing*, Sept. 17, 1914.

Generation, Transmission and Distribution

Irrigation Dams.—E. KILBURN SCOTT.—A long abstract of a paper read before the recent Australian meeting of the British Association. The author discusses the building of large irrigation dams and the utilization of the water not only for irrigation but also for developing hydroelectric power. Examples are given from practice in Argentina, the United States, Egypt and Australia. The author refers to working with variable heads. For heads varying from two or three to one, or, say, 150 ft. down to 50 ft., the difficulty can be met by a suitable design of turbine, although, of course, the turbine cannot work so efficiently as when it is under a constant head. For constant voltage and frequency the turbine must run at a fixed speed to suit the lowest

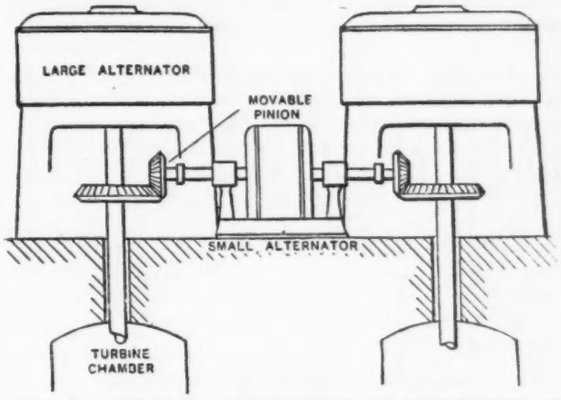


FIG. 1—PROPOSED ARRANGEMENT OF MACHINERY AT ASSUAN DAM

head, and above that the extra head is lost. Of course, less water is required at the higher heads, but the power possibilities of the dam are reduced considerably. A method which has been considered for Assuan is to have two electrical generators and one turbine, as shown in Fig. 1, the large alternators to be mounted on the top of vertical shafts, umbrella fashion, and the small alternator to be horizontal and driven by bevel gearing from the turbine shafts. When the large alternators are connected to the circuit the small alternator is thrown out of use by moving the pinions out of gear. When the small alternator is in circuit the large alternators run around as well, and merely act as flywheels. Of course, when the small alternator is in use the turbine speed is reduced. The uses of power are discussed with special reference to electrochemical applica-

tions and the manufacture of fertilizers.—London *Electrician*, Sept. 18, 1914.

Three-Phase Systems.—Charles Fortescue.—A paper in which the author discusses relative advantages of several common methods of connecting transformers for use on polyphase systems. His conclusions are as follows: For a transmission emf below 44,000 volts transformers with either star-connected or delta-connected high-tension windings may be used. The delta connection has a slight advantage owing to its greater flexibility. For a transmission emf above 44,000 volts transformers with star-connected high-tension windings should be used. These conclusions are based not so much on theoretical considerations as upon the results of actual experience in the manufacture, installation and operation of transformers on systems employing both the delta-delta and delta-star connections. The delta-star system has been consistently advocated for high-voltage transmission for more than a decade. During the early part of the history of the electrical industry, at a time when very few high-voltage transmissions existed, this attitude was subject to much criticism, but time and experience have provided the justification of the system.—*Elec. Journal*, September, 1914.

Traction

Rail Welds.—An illustrated account of recent improvements in making the "thermit" insert joint. The lower part of the rail is welded together into one homogeneous mass by means of the superheated thermit steel poured around it, while the head of the rail is butt-welded to a small insert of rail steel. The most important recent improvement is the method now used for making the molds and luting them by means of molasses where they butt against the rails so as to prevent the superheated thermit steel, which is exceedingly liquid, from running out. By this and other improvements it has become possible to reduce both the time of the weld and the amount of thermit required.—*Reactions*, No. 3, 1914.

High-Voltage Direct-Current Traction.—P. Amsler.—Translations in abstract of his two recent German papers on electric traction with high-voltage direct current and on a converter for car lighting for use with this system.—London *Electrician*, Sept. 25, 1914.

Charging Plug for Electric Vehicles.—An illustrated description of a charging plug and receptacle recommended by the (British) electric-vehicle committee for standardization for use in connection with the charging of batteries of electric vehicles in central stations or in garages where charging current is available.—London *Electrician*, Sept. 25, 1914.

Installations, Systems and Appliances

Liquid Resistor.—A note on a recent British patent (No. 18,000, 1913) of Brown, Boveri & Company. The electrodes are suspended in a vessel the lower end of which is sealed by liquid contained in a tank beneath. This tank is suspended on ropes which pass over pulleys and is counterbalanced by suitable weights, so that it may be raised or lowered easily. Raising this tank decreases the resistance. No flexible leads or rubbing rings and brushes are needed. The specification also describes a method of maintaining the required quantity of liquid in the tank by means of a float valve.—London *Elec. Eng'ing*, Sept. 3, 1914.

Small Central Station.—C. F. Weiland.—A translation in abstract of his recent German article on a new type of small central station for lighting a city of 2000 inhabitants. Two 10-kw, three-phase generators are used, together with a battery for the requirements at night. The battery is operated in connection with a 2.3-kw, three-phase generator, a direct-current machine for charging and an induction motor of 8.5 hp.—London *Electrician*, Sept. 25, 1914.

Operation of Machinery.—E. C. Parham.—An account of various practical experiences in the operation of electrical machinery under the following headings: alternator paralleling kink; armature bands breaking; an effect of low frequency; rotor resistor heating; motor starting blew circuit-breaker; reversed compensator coil, and graduating resistance steps.—*Gen. Elec. Rev.*, October, 1914.

Wires, Wiring and Conduits

Copper.—L. Addicks.—A paper presented before the American Institute of Metals on the commercial classification of refined copper. Electrolytic cathodes generally run about 99.95 per cent copper, much of the missing 0.05 per cent probably being hydrogen. The metallic impurities generally total about 0.02 per cent. The second part of the paper deals with the uses of copper. Electrical uses immediately impose a conductivity requirement which rules out everything but electrolytic and high-conductivity Lake, which are practically identical coppers. Most of the electrolytic refineries figure on averaging about 100 per cent soft in the electrical conductivity (on Matthiessen's standard) of their outputs. Occasional lots may reach nearly to 101 per cent and some may approach 99 per cent, while 98.5 per cent is the usual rejection limit; but it is very unusual for a refinery to ship anything for electrical use which is below 99 per cent. No distinction is made between cakes, wire-bars and ingots, more than one shape often being cast from a single furnace charge, so that there is nothing to be gained by ordering wire-bars and then cutting them up when ingots are desired.—*Met. and Chem. Eng'ing*, October, 1914.

Electrophysics and Magnetism

Villari Critical Point in Ferromagnetic Substances.—S. R. Williams.—A brief abstract in an American Physical Society paper on the change in length effect due to magnetization and the change in magnetization arising from a longitudinal pull. The first phenomenon is known as the Joule magnetostrictive effect and the second as the Villari reversal effect. The results indicate that for those substances in which a reversal of the Joule effect occurs there also appears a Villari reversal. Specimens showing only an elongation for all field strengths exhibit only an increase of magnetization due to a longitudinal pull, while those rods in which contraction for all field strengths appears manifest a decrease of magnetization due to a longitudinal pull. Nickel is the most interesting of all the specimens studied. It can be made to exhibit or not exhibit a Joule reversal and also a Villari reversal effect, depending upon whether or not complete demagnetization has been previously secured. This is an important point and will clear up the controversy between the various investigators of this subject.—*Phys. Review*, September, 1914.

Electrochemistry and Batteries

Primary Battery.—A brief note on a French patent for a primary battery of the Leclanché type where in the positive electrode of dioxide of manganese and graphite the graphite is replaced by lamp-black obtained from the decomposition of acetylene. When acted upon by an electric spark discharge, gaseous acetylene decomposes to hydrogen and carbon, this giving a chemically pure carbon. Its density is only 0.9, while that of graphite is from 2.17 to 2.30. In this way it is possible to increase the proportion of dioxide of manganese and obtain a more regular working of the cell than with natural graphite, whose composition is variable. The finely divided state of the acetylene carbon is also held to give a more intimate mixture with the dioxide, and hence a better result. Another patent relates to a method of

working batteries of the above type so as to use considerable current from them and at the same time not to run the battery down. The inventor treats the usual dioxide and graphite mixture by adding to it an oxide of mercury, preferably red mercuric oxide, and in such case the output of the cell may be increased several times and the battery can thus give heavier currents than before, while still maintaining the voltage. He further strengthens the battery by using an alkaline electrolyte, such as caustic soda or potash.—London *Electrician*, Sept. 18, 1914.

Units, Measurements and Instruments

Standard of Field Strength.—R. BEATTIE.—An illustrated article on the use of an electromagnet as a standard of field strength, with special compensation for variations in the exciting current. It is only necessary

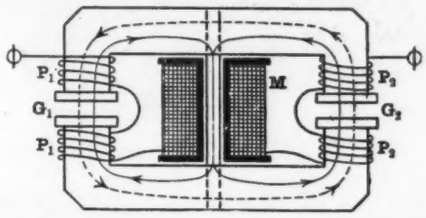


FIG. 2—ELECTROMAGNET FOR MAINTAINING CONSTANT MAGNETIC FLUX

to impose on the main flux in the magnet gap an opposing or compensating flux created by an auxiliary series winding the number of turns of which is so adjusted that the compensating flux increases or decreases with changing current at the same rate as the main flux. To provide a path for this compensating flux the magnet must be furnished with auxiliary poles P_2P_2 in parallel with the main poles P_1P_1 (Fig. 2). Both sets of poles may carry compensating windings N_2 and N_1 turns respectively. These are joined in series with each other and with M, the main winding, N_1 being connected up to oppose the main flux in gap G_1 and N_2 to aid the flux in gap G_2. The compensating windings, therefore, act together in maintaining a flux round the local circuit indicated by the dotted line in the figure, this flux being superposed on the main flux, which divides between the main and auxiliary gaps and follows the paths shown by the arrow-marked full lines. If the ratio of N_1 to

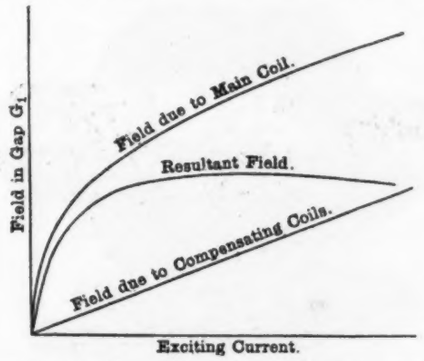


FIG. 3—COMPONENTS OF FLUX ACROSS CONSTANT-FIELD GAP

N_2 equals the ratio of the reluctances of gap G_1 to gap G_2, the compensating flux is entirely independent of the main flux, following the dotted path in the figures and not entering the main magnetic circuit at all. With a main magnetic circuit of small section, and therefore easily saturated, the field in G_1 due to the current in M is represented by the upper curve of Fig. 3, while the field in G_1, due to the compensating coils, being linear in relation to the exciting current, is represented by the straight line. The resultant field in G_1, or the difference between the two, is represented by the middle curve. By choosing N_1 and N_2 so that the line representing the compensating flux is parallel to the general slope toward the end of the upper curve, it is easy to get a resultant curve with a very flat maximum corresponding to a constant field in G_1 over a wide range of exciting current. In experiments with this arrangement the author found there was no special difficulty in getting the field in the main gap constant to within one or two parts in a thousand over a range of variation in the exciting current amounting to 100 per cent or more. With a suitable winding the magnet may thus be connected up to the ordinary lighting circuit, and it may be relied on to maintain a practically constant field in spite of variations in the supply voltage or variations in the exciting current due to the heating of the magnet coils.—London *Electrician*, Sept. 18, 1914.

Telegraphy, Telephony and Signals

Telephony.—HANS CARL STEIDLE.—The first parts of an article pointing out that for the fullest utilization of a telephone network special attention should be paid to small subscribers by making use of automatic exchanges of smallest sizes for small groups of subscribers. The system is compared with party lines.—*Elek. Zeit.*, Aug. 6 and 13, 1914.

Resistance of the Spark.—J. STONE STONE.—A mathematical paper on the resistance of the spark and its effect on the oscillations of electric oscillators. This paper was presented before the British Institution of Radio Engineers.—London *Electrician*, Sept. 18, 1914.

Book Reviews

DIE QUARZLAMPE, IHRE ENTWICKLUNG UND IHR HEUTIGER STAND. By Dr. J. C. Pole. Berlin, Germany: Julius Springer. 84 pages, 47 illus. Price, 4 marks.

This little volume gives much useful technical information in condensed form concerning the quartz-tube mercury-vapor high-temperature lamp. It is intended for electrical engineers, students of illuminating engineering and the technically informed inquirers into this comparatively modern illuminant. The book is divided into seven chapters, dealing respectively with the following topics: Introduction, theoretical principles, technical principles, the direct-current quartz lamp, the alternating-current quartz lamp, the ultraviolet radiation from the quartz lamp, quartz lamps for ultraviolet rays in practice. This book is clearly written and well illustrated.

ELECTRIC COOKING, HEATING AND CLEANING. By Maud Lancaster. American edition, revised by Stephen L. Coles. New York: D. Van Nostrand Company. 329 pages, 305 illlus. Price, $1.50 net.

A practical, interesting and popularly written manual of electricity in the service of the home. The large number of illustrations, especially of American household electrical devices, and several simply prepared charts should be of great help to the layman who has not seriously considered the manifold uses of domestic electric service as well as to those whose homes are only partly equipped electrically. Mrs. Lancaster, who for a number of years has used electricity exclusively in the operation of her home in England, writes from a full practical experience in her subject, and her book should make a strong appeal to the progressive housewife.

New Apparatus and Appliances

An Illustrated Descriptive Record of Recently Developed Manufactured Products of Interest to Electrical Readers

Inclosed Reversing Switches for Squirrel-Cage Motors

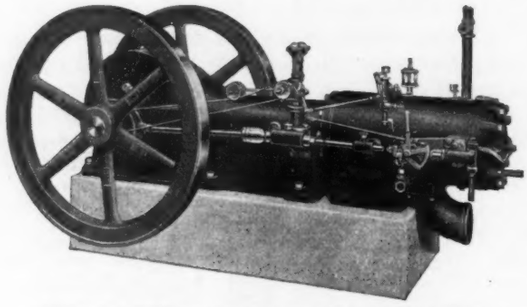
Inclosed drum-type switches designed to reverse small squirrel-cage motors have recently been developed by the Cutler-Hammer Manufacturing Company, Milwaukee, Wis. The switches are operated by means of a handle or by ropes. In the latter case the switch may be installed on the ceiling or otherwise out of reach. These switches are adapted for use on small alternating-current elevator equipments driven by high-resistance rotor squirrel-cage motors. The inclosing

REVERSING SWITCH WITH COVER REMOVED

case protects the switch contacts from dust and dirt and prevents accidental touching of the live parts.

Two-Stroke-Cycle Oil Engine

A two-stroke-cycle, low-compression, single-cylinder oil engine, operating with low-grade fuel, is being made by the Chicago Pneumatic Tool Company, Chicago, Ill. This engine is built in sizes with ratings of 12 hp, 18 hp, 25 hp and 45 hp. The cylinder is of the valveless type, water jackets being cast integral with the cylinder. The piston is connected to the flywheel shaft through a crosshead. Ignition is accomplished by means of a thin circular plate attached to the piston which becomes hot after the engine is started and instantly gasifies and ignites the fuel injected against it. The fuel nozzle is a combination ball check valve and nozzle and is made of bronze. Water is injected into the oil through a needle valve which is automatically controlled by the governor. The smaller engines can be started by hand, but for the largest size, and for the smaller when desired, a small vertical single-acting air compressor driven from a pulley bolted to the flywheel is used. This compressor delivers air to a stor-

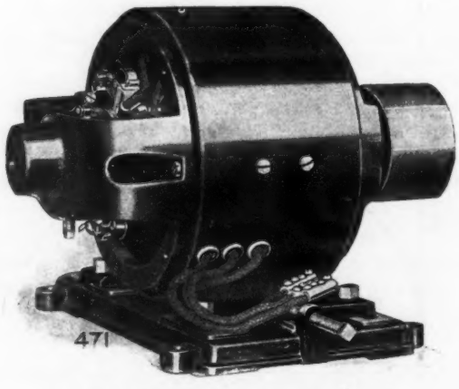


ENGINE OPERATING WITH LOW-GRADE FUEL

age receiver designed for a working pressure of 150 lb. per sq. in. By means of a lever-operated air starting valve, the engine can be run on air until the firing of the fuel has taken place in the cylinder.

Steel-Frame Direct-Current Motors

In the illustration herewith is shown one of several types of direct-current motors recently placed on the market by the Robbins & Myers Company, Springfield, Ohio. The motors are equipped with cast-steel frames and are designed for service where space is restricted or where light and compact construction is desirable for any other reason. The motors are of the bi-polar type and are made with four different frame sizes with ratings of ⅛ hp, ¼ hp, 1/3 hp, ½ hp, ¾ hp, 1 hp, 1.5 hp and 2 hp. They are built for operation with all standard voltages and are provided with the open-type, the semi-inclosed, the fully inclosed or the grid type of frame. The motors may be equipped with idler-pulley attachments or back gears where either construction



OPEN-FRAME-TYPE 1-HP MOTOR

is desired. Each motor is provided with a sliding base, pulley and no-voltage-release starter. The bearings are of phosphor bronze and are lubricated by oil rings. The pole pieces and armature core are built up of steel laminations. The armature coils are wound directly into the slots. The brush holders are mounted on an adjustable rocker and are of the sliding-box type.

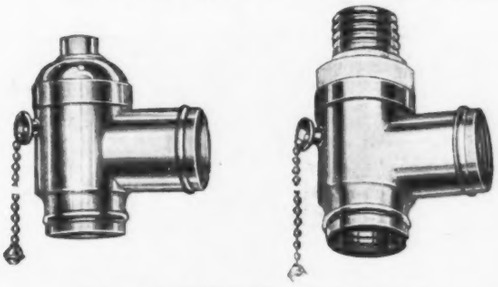
Direct-Current Cable-Testing Ammeter

A direct-current cable-testing ammeter designed to measure the current in a conductor without disturbing the circuit has recently been developed by the Metropolitan Engineering Company, Brooklyn, N. Y. In principle the instrument is similar to those of the D'Arsonval type, excepting that in place of the permanent magnet there is a detachable iron loop and the moving-coil circuit is energized by a small auxiliary battery. When the iron loop incloses an energized conductor the flux in the magnetic circuit of the instrument is proportional to the current in the conductor, and as the moving coil is energized from an independent source, the current from which is constant, the deflections of the pointer on the scale are proportional to the current in the conductor. The calibration of the instrument is simple as it is only necessary to insert in the loop an energized conductor the current in which is known and regulate it by means of a resistor of variable resistance provided in the moving-coil circuit. The instrument is compact and weighs 4.5 lb.

DIRECT-CURRENT CABLE-TESTING AMMETER

Twin Pull Sockets

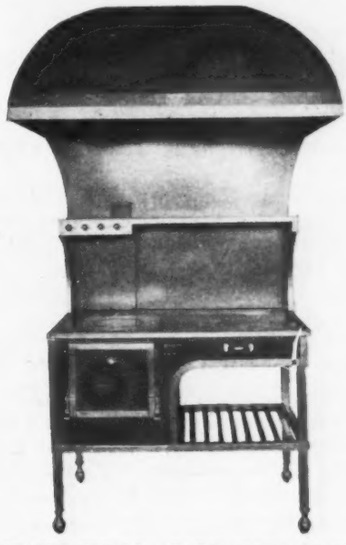
Pull sockets with outlets for two lamps are being made by the Bryant Electric Company, Bridgeport, Conn. Aa attachment plug, of course, may be substituted for one lamp or two attachment plugs may be used instead of two lamps. This socket is made in two types. In one type both outlets are simultaneously turned on or off by successive pulls of the chain. In the other type the straight outlet alone is affected when the chain is pulled, the lamp in the angle outlet being on all the time. The first type is useful where it is desirable to turn on and off two energy-consuming devices at the same time or where one outlet holds a lamp which serves as a pilot lamp for an appliance connected to the other outlet. The second type is useful when it is desired to equip a lamp or other energy-consuming device with its own switch connected to the angle outlet. A shade holder can be attached to either outlet and can be held in its normal position relative to the lamp.



PULL SOCKETS WITH TWO OUTLETS

Electric Bungalow Range

A range designed for use in small apartments and dwelling houses has been developed by Wells, Mowbray & Newman, Inc., 125 West Forty-second Street, New York. The range is equipped with a surface heater and a combined oven and salamander. When using the oven for baking or roasting a baffle plate is placed immediately below the top element. For broiling this plate is removed and a grid is placed in the oven on guides. The switches are of the indicating single-push-button type and are equipped with pilot lamps. The surface cooker is provided with two heats. The oven heater also has two heats. The body of the range is of sheet steel, the facings of polished Russia iron and the trim of polished sheet aluminum. The dimensions are 24 in. front, 24 in. deep and 33 in. high. The oven is 14 in. by 14 in. by 16 in. The outside cooking surface is 20 in. by 20 in. A large hood is provided, as shown in the accompanying illustration, which when connected to a ventilating system removes the fumes from cooking.



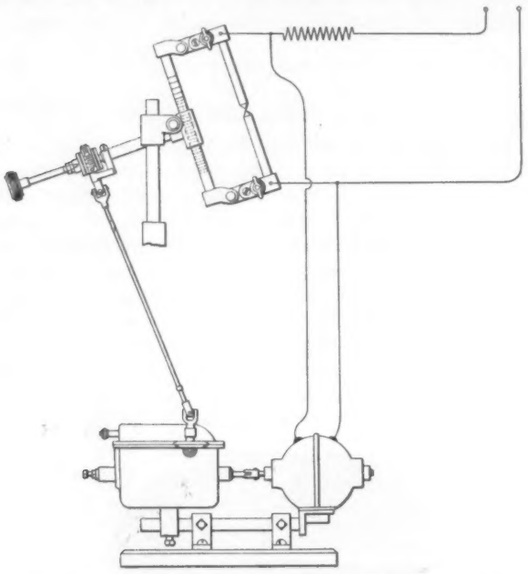
RANGE FOR SMALL APARTMENTS OR HOUSES

Controller for Arc-Lamp Feed

A device for controlling the feed of arc-lamp electrodes for motion-picture purposes is illustrated in the accompanying diagram. The controller itself consists of a set of gears running in an oil bath and is connected directly to a 1/16-hp motor. A toggle-joint rod connects the controller to the feeding arms of the lamp.

The armature of the motor is connected in shunt with the arc-lamp circuit. The motor is so designed that its speed is susceptible to all changes in voltage; therefore, as the electrodes burn away and the voltage rises as a result, the speed of the motor and consequently that of the controller is increased. This increase in speed when above a certain predetermined amount causes the

toggle-joint rod to move and to bring the electrodes together just enough to compensate for the increased voltage. It is claimed by the manufacturers that the controller moves the electrodes by average feeds of 0 0005 in. per electrode. The manufacturers also assert that the principle embodied in the controller described



MOTOR-DRIVEN CONTROLLER FOR ARC-LAMP FEED

above is applicable to the control of air brakes, speed of vehicles, output of generating stations, etc.

The controller is being made by the Speed Controller Company, 257 William Street, New York.

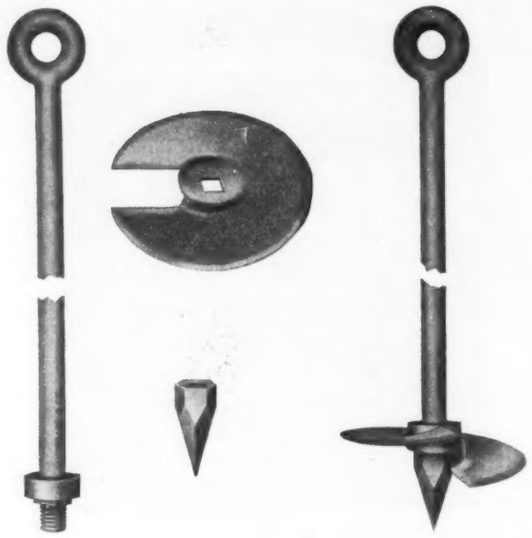
Receptacle for High Candle-Power Lamps

A rugged cleat receptacle designed for use with large-sized incandescent lamps has recently been developd by Pass & Seymour, Inc., Solvay, N. Y. The manufacturers declare that the energy-carrying parts are not only ample but are also exceptionally strong from a mechanical standpoint. The device is illustrated herewith.

EXTRA-STRONG RECEPTACLE FOR LARGE-SIZED LAMPS

Screw Guy Anchor

An all-steel screw guy anchor with interchangeable plates to provide for different soil and load conditions is being manufactured by Hubbard & Company, Pittsburgh, Pa. Fig. 1 shows a disassembled and Fig. 2 an assembled view of this device. The anchor is provided

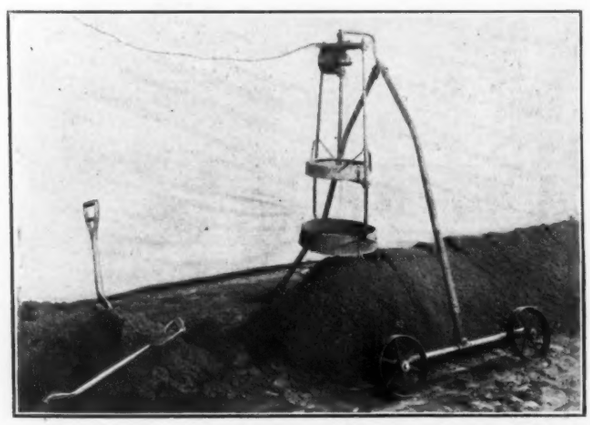


FIGS. 1 AND 2—GUY ANCHOR DISASSEMBLED AND ASSEMBLED

with a large bearing surface. It is of open-hearth steel and is galvanized by the hot-dip process. The wings are made in three sizes with diameters of 6 in., 8 in. and 10 in. respectively, and they are equipped with rods 0.75 in., 1 in. and 1.25 in. in diameter. All the rods are 5 ft. 6 in. long. A drop-forged cap screws on the end of the rod to hold the plate in place. To install this anchor, it is first necessary to remove a shovelful of earth to give it a start; then a bar is thrust through the eye of the rod and the anchor is screwed in place.

Gyratory Foundry Riddle

The foundry riddle or sand screen made by the Great Western Manufacturing Company, Leavenworth, Kan., consists of a 1/6-hp motor driving an unbalanced weight attached to a vertical shaft. The motor shaft operates at 1750 r.p.m. and drives the vertical shaft at 250 r.p.m. by means of an inclosed worm-reducing gear. An ad-



MOTOR-DRIVEN GYRATORY SAND SIFTER FOR FOUNDRY WORK

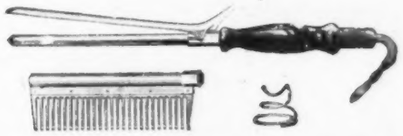
justable unbalanced weight attached to a horizontal arm at the lower end of the vertical shaft gives the suspended riddle a sharp jerk at each revolution. The gyratory riddle exclusive of its support weighs approximately 100 lb., making it easily portable. This device, the manufacturers declare, will sift continuously as much sand as two laborers can shovel into the riddle.

Sealing Wax for Electrical Fittings

Two grades of sealing wax, one with a melting temperature of 150 deg. Fahr. and the other of 200 deg. Fahr., are being made by the Insulating Materials Company, Detroit, Mich. Either grade may be colored red, brown, black or white as desired. The wax is used for sealing screw heads, nuts, bolts and other live parts used in electrical apparatus. It has been approved by the Underwriters' Laboratories, Inc.

Combination Curling Iron and Drying Comb

To enable the user of an electric curling iron to combine its functions with a hair drier, Landers, Frary & Clark, New Britain, Conn., recently placed on the market the curling iron and drying comb illustrated herewith. The outfit takes only 20 watts and is finished in nickel. The heating element of the curling iron is of the flanged, flat type, fitting closely to the shell, the design providing for expansion and contraction. The comb, made of aluminum, slides upon the iron and snaps into place with a small pressure of the finger. With this equipment women need no longer wait for a sunny day before shampooing their hair. The combination equipment greatly simplifies electric hair drying.



ELECTRIC CURLING IRON AND DRYING COMB

Lock Plug

A plug designed for use with screw-base sockets or outlets which can be locked when in place is being made by the Yost Electric Manufacturing Company, Toledo, Ohio. After inserting the plug in place a slight turn is made to the right. Before turning a slight pressure is exerted to compress a plunger. The plug is disconnected by reversing this operation. It is known as the "lockfast" plug. By means of a quick-make-and-break connection the manufacturers assert that the circuit can be instantly opened or closed. The insulating material used in the manufacture of this device is a substance called "thermoplax," which, it is declared, will not burn or soften at a temperature of 600 deg. Fahr. By depressing a small spring with a pointed instrument or a piece of stiff wire the interior part of the device can be slipped out of the shell. After wiring the interior can be replaced and then is automatically locked.

LOCK PLUG FOR SCREW-BASE SOCKETS

Portable Wagon and Truck Loaders

For loading loose materials such as coal, sand, stone, gravel, etc., from ground storage to wagons or trucks, various types of electrically operated portable loaders have been developed by the Link-Belt Company, Chicago, Ill. In Fig. 1 is shown a diagram of one of these loaders designed for use with anthracite coal. The apparatus includes a shaking screen at the head, which can be of any mesh desired. At the foot of the conveyor is another conveyor for feeding the coal to the buckets. The elevator consists of double-strand chains attached to malleable-iron buckets, 16 in. by 6.5 in. The total weight of the apparatus is 2700 lb. The conveyor is operated by a 3-hp motor.

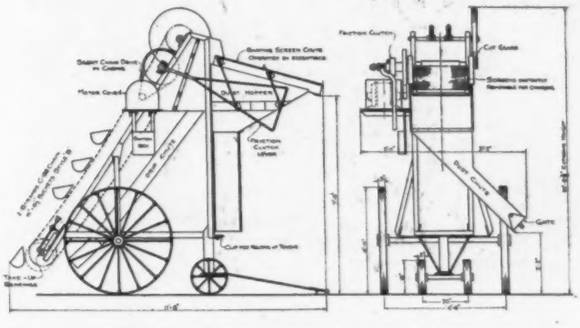


FIG. 1—DIAGRAM OF CONSTRUCTION

For use in yards where it is necessary to move the loader under a load shed or from one side of a low trestle to the other, the collapsible, bituminous-coal loader shown in Fig. 2 has been developed. The bucket-elevator part is pivoted nearly in the middle, and by turning a crank which operates a worm gear the foot of the machine is raised and the head lowered, thereby reducing the height so that it will pass under the obstruction. The total weight of this loader is 4900 lb., and it is operated by a 5-hp motor.

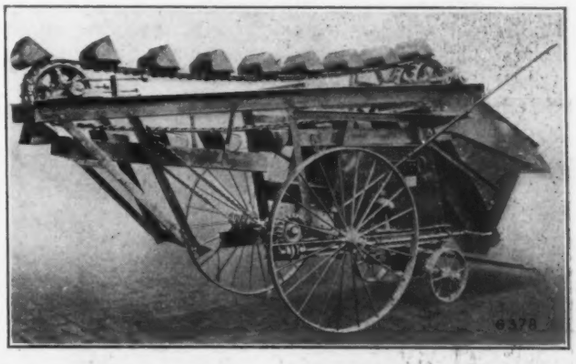
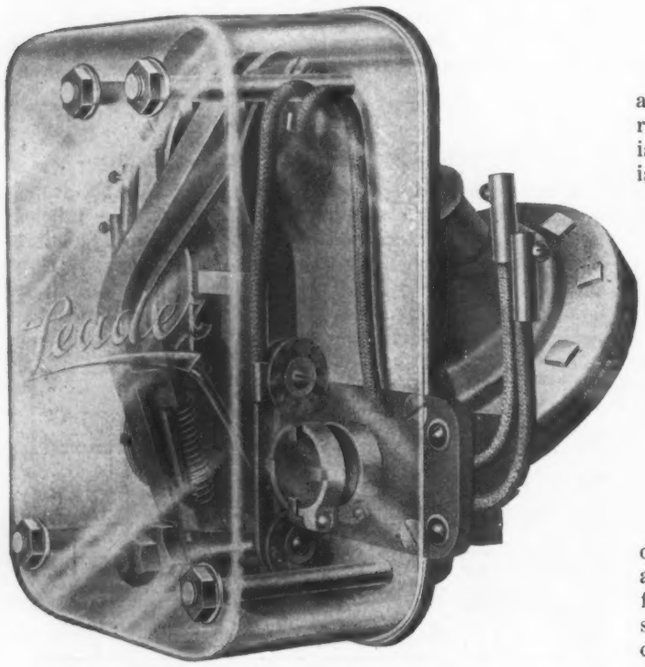


FIG. 2—PORTABLE WAGON LOADER FOR ANTHRACITE COAL

Controller for Electrically Operated Pneumatic Water System

An automatic controller for a motor operating a small pneumatic water system or an air compressor is being manufactured by the Leader Iron Works, Decatur, Ill. The controller is light and compact and can be mounted on any piping which is substantially supported. The

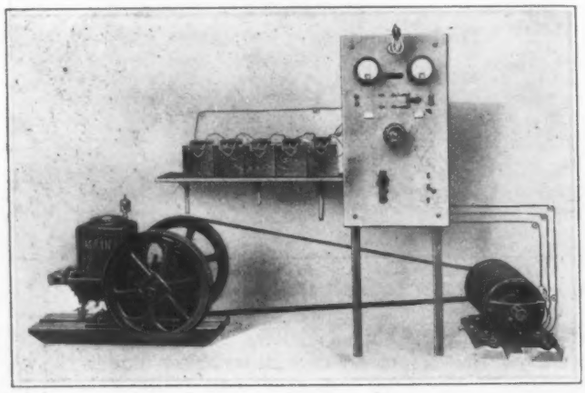


ELECTRIC CONTROLLER FOR MOTOR-DRIVEN AIR COMPRESSOR

actuating parts are a diaphragm and spring which operate a switch. The switch contacts are carbon disks 1 in. in diameter and are mounted in brass collars. The controller can be set to operate at a minimum pressure of 5 lb. per sq. in. and a maximum of 150 lb. per sq. in. All working parts are incased in a glass cover.

Small Lighting Outfits

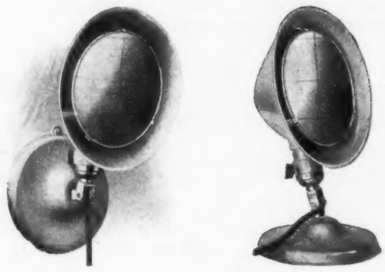
Lighting plants varying in rating from 0.25 kw to 200 kw are being made by the Main Electric Manufacturing Company, 219 South Beatty Street, Pittsburgh, Pa. The generators are driven by gasoline engines of the horizontal, four-stroke-cycle, hopper-cooled, valve-in-head type with ratings of from 1 hp to 325 hp. Each generator is provided with a sliding base for taking up belt slack. The battery is equipped with either open or glass cells. The switchboard is of marble mounted as shown in the accompanying illustration on angle irons and is 60 in. high. It contains the meters, switches, circuit-breaker and controlling rheostat.



SMALL LIGHTING PLANT

Adjustable Lighting Fixture for Shaving

A portable lighting fixture equipped with a mirror and provided with a hinged joint so that the lamp and reflector can be adjusted through a wide range of angles is shown herewith. The mirror is 6 in. in diameter and is supported by three clips which hold it flush with the

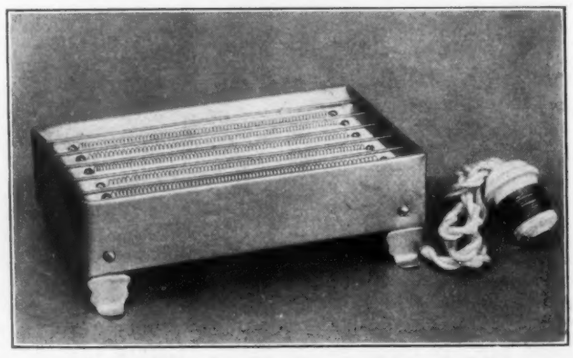


LIGHTING FIXTURE FOR SHAVING

opening of the reflector. The mirror is surrounded by an open space of 1 in. through which the light is diffused. Although the fixture is designed primarily for shaving purposes, by removing the mirror advantage can be taken of its adjustable features for use as a piano or desk lamp. The fixture is equipped with a lug in the base so that it can be hung on the wall. This device is being manufactured by the Holophane Works of the General Electric Company, Cleveland, Ohio.

Flat-Type Quick-Heating Toaster

A toaster being marketed by the P.-J. Electric Heating Company, 714 Postal Telegraph Building, Chicago, is notable for its light and inexpensive construction and for the rapidity with which the heating elements reach their normal operating temperatures. The device measures 7 in. by 4 in. by 1.5 in. and weighs 31 oz. The 450-watt heating elements, composed of five 6-in. by 0.125-in. nichrome 26-gage wire helices, come to a red heat in less than ten seconds after they are placed in circuit. The frame of the toaster is of nickel steel, and the base upon which the heating element is mounted is formed of an asbestos composition.



TOASTER, SHOWING ARRANGEMENT OF HEATING ELEMENT

Jobber, Dealer and Contractor

Legislation as It Affects the Electrical Contractor

In addressing the first convention of Massachusetts Electrical Contractors at Worcester recently, Mr. A. J. Hixon, of Boston, Mass., pointed out that so-called constructive legislation designed to build up business cannot properly be put upon the statute books, the securing of such business being largely a matter of constitutional rights. The recent license law in Louisiana was declared unconstitutional because it attempted to create constructive out of corrective legislation, and hence the whole structure of what should have been a most satisfactory law was lost. There is an opportunity to legislate to the advantage of the electrical contractor upon his relations with the general public to protect the latter and establish responsibility for installations. Suitable license laws should serve to identify the responsible party rather than to specify how the work should be done. It should be made a criminal offense to do irresponsible work. License laws should be state laws, mandatory and enforced by city police departments. A wise license law, carefully enacted and wisely administered, will do more than any other single thing to improve the status of the electrical contractor. Public officials should be required to let all natural sub-contracts separately, and the practice of awarding general contractors widely inclusive contracts should be prohibited on all work not of a private nature. A law to this end has been enacted in New York, Pennsylvania and New Jersey. The American Society of Architects has also condemned the practice of letting unit general contracts. Efforts will be made to secure a new license law at the next session of the Massachusetts Legislature, as well as a law in relation to segregated contracts.

Business Building

When an electrical contractor secures the name of a customer on the dotted line of an agreement stating that he is to receive a specified sum of money for installing a certain number of lamp outlets, the contractor is usually quite sure that a percentage of profit will come to him from the work. That profit as a rule is not great when figured on the basis of percentage of the gross amount of the contract. Keen competition has made the contractor bid low to get the work.

When he has secured the job, however, advantage is his. He can disprove the belief sometimes prevalent that wiremen make a home look as if the plumber had been there. He can cultivate the customer's closer acquaintance and tell him about the latest electrical household labor saver. Contractors know of these things but sometimes fail to realize the electrical ignorance of the average householder and to appreciate the householder's desire for electrical knowledge. It is the salesman who can tell his customer something new that wins admiration and respect, and the contractor can do this. He should make it a rule to tell every customer of some electrical device of which the latter has not known before. Then when electrical goods are to be bought for the home or for gifts the man of the house will say: "That contractor, Jones, keeps posted on all new electrical things. Wife, you had better call at his shop before you buy."

So it is with lamps. The contractor who, having been courteous and prompt in carrying out his wiring agreement, calls attention to the good grade of lamps he handles seldom fails to get renewal orders when the 1000-hour period has passed. One lamp purchase at the contractor's shop leads to another, for every person is a persistent follower of habit. The lamp business is not to be despised, for contracts may come and contracts may go, but the lamp trade continues as long as there is a clerk behind the counter who never forgets to say "Thank you" when he takes a buyer's money. Clerks in a well-known chain of red-front cigar stores never forget that phrase, and the chain has grown apace with the number of "Thank yous" dealt out with 5-cent and 10-cent purchases.

Thus business building with the wiring agreement as the basis can profitably be made the aim of electrical contractors. A worthy motto is, know your customer and let him know you before his wiring contract is completed.

Window Electric-Cooking Demonstration

In order to determine to what extent the public would be attracted, Wells, Mowbray & Newman, Inc., 125 West Forty-second Street, New York, recently installed, at the request of the Hershey Chocolate Company, one of their electric "bungalow" ranges in the window-display space of the Hershey showroom in New York, and demonstrated to passers-by the simplicity and cleanliness of cooking by electricity. Each operation was explained by means of the blackboard which is shown in the accompanying illustration. Cocoa and chocolate constituted one of the ingredients in everything cooked. Considerable interest was shown in the demonstration, and it elicited many inquiries. The accompanying illustration shows a typical group of spectators, in which housewives are prominent.

WINDOW DEMONSTRATION OF ELECTRIC COOKING

Regulation of Electrical Work in Cincinnati

An ordinance providing for a board of examiners of electrical contractors, to consist of two contractors and a journeyman electrician, has been introduced in the City Council of Cincinnati for the purpose of regulating electrical work in that city. The measure is in reality designed as a revenue producer and provides for the payment by all contractors within sixty days of its enactment of a license fee of $25, with an annual fee of $5. Provision is also made for the payment of a fee of $1 for a permit on each job. A bond of $1,000 will also be required as a guarantee of the faithful performance of contracts. The proposed new department will be under the supervision of the office of the city building commissioner.

Industrial and Financial News

Public Utility, Commercial, Corporate and Trade Developments—The Electrical Material and Security Markets

Washing-Machine Company Increasing Manufacturing Space.—The Dodge & Zuill Manufacturing Company, Syracuse, N. Y., has increased the size of its plant to take care of the large number of orders for washing machines being received. This company carries on many demonstrations of its machines, and the operators are both men and women who are experienced in selling.

Portable Fixtures for Christmas Gifts.—The Weintraub Brass Manufacturing Company, 27 Bleecker Street, New York, has on hand a number of artistically designed fixtures which are proving popular for the holiday trade. These fixtures are of brass with silk linings in various colors, and the larger fixtures are equipped with cut-glass prisms. The company's manufacturing establishment is being kept busy to fill the numerous orders recently received.

Storage-Battery Company's Plant Working Night and Day.—The Philadelphia Storage Battery Company is very busy and the plant at Philadelphia is kept in operation day and night to take care of the large number of orders being received. This company has service depots all over the country and is opening many new depots in the Pacific Coast territory. In New York City a sudden increase in business has been noted. This is owing to the fact, it is said, that owners of elecric vehicles are preparing for winter.

Reduce Cost of Refilling High-Voltage Fuses.—The firm of Schweitzer & Conrad, Inc., of Chicago, manufacturers of S & C fuses, has made arrangements to refill its fuses at about two-thirds of the former re-fusing cost, thus making the maintenance expense very small. When the glass tubes are returned to the manufacturers in good condition fuses for 33,000-volt lines and higher pressures are refilled for 15 per cent of the list price of the device, 22,000-volt units for 25 per cent, and 4400-volt and 6600-volt fuses for 30 per cent.

Bronze-Plated Ornaments.—Various kinds of bronze-plated ornaments are being made by the Bronze Depositing Company, 348 West Forty-second Street, New York. The ornament is molded out of plaster of paris and then is coated with a metallic paint. It is next dipped in an electrolytic bath and receives a bronze covering. As a result a light ornament is made which in all outer aspects resembles the more expensive solid-bronze articles. This class of goods is particularly well adapted for holiday trade and the above company is being kept busy filling orders for the coming season.

Good Demand for Motors and Arc-Welding Apparatus.—The C & C Electric & Manufacturing Company, of Garwood, N. J., reports that there is a continued demand for its motors for driving fans, blowers, pumps, etc. Contracts have been signed for supplying a large number of motors to the Yale Club, the Grand Central Station, the Ætna Life Insurance Company and other large buildings in New York City. It is also reported that the sales of automatically controlled electric arc-welding equipment are good and that the export business in motors, generators and welding apparatus is increasing.

Vacuum Cleaners for Cleaning Generators.—Several vacuum cleaners made by the Duntley Products Company, Erie, Pa., were recently installed in Ehret's brewery, New York, to clean four 250-kw generators and the switching equipment. Autumn is one of the best seasons for the vacuum-cleaning industry, and the Duntley company has been very busy as a result. The plant has been in operation night and day this fall, and recently the manufacturing space has been increased 30 per cent to take care of the large number of orders received. During the past month, it is reported, over 1500 cleaners have been sold.

High-Duty Centrifugal Pumps for Philadelphia.—The two turbine-driven centrifugal pumps recently purchased by the city of Philadelphia and mentioned in these columns on Oct. 10 are remarkable because of the high duty which has been guaranteed for this type of pump. It is declared that they will be capable of performing 145,000,000 ft.-lb. of work with a consumption of 1000 lb. of steam. The importance of these pumps was underestimated in our note regarding them because of a typographical error. Instead of being able to supply only 2,000,000 gal. a day, as stated, each one will be capable of delivering 20,000,000 gal. a day.

Two-Motor Concentric-Gear Drive for 1000-lb. Truck.—A 0.5-ton wagon equipped with two-motor concentric-gear drive has recently been developed by the Commercial Truck Company of America, Philadelphia, Pa. Heretofore this type of drive has been used only on the 1-ton and 2-ton trucks made by the company. Two General Electric motors are used. The wagon develops a speed of 13 miles an hour and will run from 40 miles to 60 miles on one charge. One of the advantages of this type of drive, it is claimed, is the elimination of differential gear. The above company has also developed a so-called gasoline-electric truck which promises to be successful.

Electricity for Photographers.—The increasing importance of electricity in photography was pointed out in various demonstrations carried on by the photographic bureau of the New York Edison Company at the recent New York electrical show. Portraits were made, using both a 1000-watt nitrogen-filled lamp and mercury-vapor lamps. A fully equipped dark room was maintained, and electric printing and drying apparatus was used. A new motor-driven print drier made by the Eastman Kodak Company was placed on exhibition for the first time. The Edison company sent out invitations to a large number of New York photographers to visit the electric studio, as the booth was called; a register was kept and over 1800 photographers are said to have signed their names in it.

Weighing and Counting Machines for Electrical Industry.—Electric companies, it is said, are the largest users of the counting and weighing machines and elevating trucks manufactured by the National Scale Company, Chicopee Falls, Mass. Because of the widespread movement for greater industrial efficiency the business of the above company, it is declared, has increased 50 per cent the past year. The elevating truck is a device designed to eliminate unnecessary handling on loading and unloading. The counting machines operate on the ratio-of-weights principle, whereby a given ratio is employed to obtain a unit, the product of its multiple or any fractional part thereof. The contents in numbers of any box, barrel, bag, truck or barrow containing an unknown number of like parts or pieces can be determined quickly and accurately without any calculations.

Electric Fountains and Baskets.—Electric fountains without connections for water mains are being made by the Electric Fountain Company, 348 West Forty-second Street, New York. These fountains are portable and are manufactured in various sizes, the largest being operated by a 1-hp motor and the smallest by a 1/30-hp motor. The motor is connected directly to a small pump. These fountains are now installed in the following New York establishments: the Keith theaters, the Strand theater, the Loew theaters, the Fox theaters, Hotel Plaza, Hotel Astor, Hotel Ritz-Carlton, Hotel Martinique, Rector's, Tiffany's and Gorham's. When operated with iced water one of these fountains will cool the surrounding atmosphere considerably. The water may be perfumed or a mild antiseptic may be added to sterilize the air. The above company is also making electric flower baskets and various electrically illuminated flowers. Business in these devices is very good.

"Fall Festival Electric" at Kansas City.—A so-called fall festival was held in the offices and showrooms of the Kansas City (Mo.) Electric Light Company, Oct. 1-10, and it is declared that over 10,000 visitors were entertained. Among the interesting features of the festival were the daily demonstrations of baking by the Hughes Electric Heating Company in co-operation with the Ismert-Hincke Milling Company, of Kansas City, which provided the material and the bakers. It is said that on one day (Oct. 9) fully 100 bakers were present to witness the operation of the electric ovens. Other prominent exhibitors were the General Electric Company and the Hotpoint Electric Heating Company. During the festival the electric-light company reduced the prices on all its heating appliances 20 per cent, and as a result a number of sales were made.

Largest Single Commercial Load Carried by Keokuk Plant.—The largest single commercial load which has ever been secured by the Electric Company of Missouri, distributer of energy generated at Keokuk, Ia., has been contracted for recently by the Continental Portland Cement Company at Continental, Mo. The connected load will be approximately 4000 hp, and the annual revenue will exceed $110,000. To serve the company it will be necessary to construct a substation containing three 1000-kva transformers. The Arrow Engineering Company received the contract for erecting the substation, which is expected to be so near completion that energy can be supplied by Jan. 1. By electrification Mr. Marks, president of the cement company, estimates that the output will be increased about 20 per cent. Twenty-five hundred barrels are turned out daily now.

Demand for Battery-Charging Devices.—Mr. H. P. Hill, Eastern agent of the Electric Products Company, Cleveland, Ohio, manufacturer of the "Wotton" vertical rectifier for charging electric-vehicle batteries, states that the business of the company in New York City for September was double that for the corresponding month of 1913. The business for the company throughout the country for the same month, it is reported, is twice as much as that for September of last year and four times that of the same month in 1912. The Electric Products Company has a number of service stations in various cities and also has so-called service men who are continually traveling from place to place and examining installations of the company's machines. The company is also manufacturing a machine for use with motion-picture apparatus which converts alternating-current energy into direct-current energy. A large number of these machines have recently been sold.

Improvements in Edison Dictating Machine.—In addition to bringing out the telescribe, which was described in the Oct. 10 issue of the *Electrical World*, Thomas A. Edison, Inc., Orange, N. J., has developed the transophone and improved its dictating machines so that their operation is almost entirely automatic and their field of use considerably widened. A hook for holding the mouthpiece tube has been attached to a switch on the front of the machine so that when it is not being used the energy supply is cut off. On raising the hook, however, the circuit is completed and the operating motor made to revolve. Another improvement has been made by inclosing the gears. By using the transophone a copyist transcribing a dictation on a typewriter can make the machine repeat the dictation by gently touching a button switch attached to the keyboard of the typewriter. The ordinary type of transcribing machine can be easily converted to give the same results with but few additions.

NEW YORK METAL MARKET PRICES

	Oct. 13	Oct. 20
Copper:		
Prime Lake	.... to 12.00†	11.37½ to 11.62½†
Electrolytic	11.60 to 11.70†	11.20 to 11.30†
Casting	11.50 to 11.60†	11.10 to 11.20†
Copper wire base	13.00 to 13.25	12.75 to 13.00
Lead	3.60	3.50
Nickel	40.00 to 45.00	40.00 to 45.00
Sheet zinc, f.o.b. smelter	8.50†	8.00
Spelter, spot	4.90 to 5.00	5.10 to 5.15
Straits tin	31.00	29.00
Aluminum, 98 to 99 per cent.	18.00 to 18.50	18.00 to 18.50

COPPER EXPORTS

Total tons to Oct. 20 13,154

†Nominal.

Corporate and Financial

Initial Dividend.—A meeting has been called of directors of the Pacific Gas & Electric Company for Oct. 31, 1914, for declaration of the initial dividend of 1½ per cent upon the full-paid first preferred stock. The board will also be asked to declare the regular quarterly dividend of 1½ per cent on the original preferred stock.

Bankers See Improvement.—Lee, Higginson & Company, of Boston, have sent out the following letter dealing with present conditions: "The sudden outbreak of the European war caused good bonds intrinsically unaffected in value to drop sharply in price so that bonds which ordinarily sell at prices to yield 4 per cent to 5½ per cent can to-day be bought to yield 5 per cent to 6½ per cent. At first we were facing a situation commercially unknown. Many were alarmed. Business was disarranged. Money was 8 per cent and hard to obtain. The last few weeks have brought improvement. Merchants are securing accommodations. The banks have strengthened their position as the weekly returns prove. Rates have fallen and, in short, confidence and courage are returning. To-day it is still the buyer's market."

Opportunities Arising from the War.—The October issue of *Facts and Figures*, issued by C. D. Parker & Company, of Boston, says: "It must have become evident to those who have studied events since the European war started that our own country, with its location, its large manufacturing establishments and its enormous natural resources, occupies a unique position in relation to the rest of the world that promises a great future. We believe that the next few years are going to be years of prosperity for this country. Money for investment has been accumulating for some time, but especially since the declaration of war. This accumulation of funds for investment must, by this time, have reached a very large figure. This money will seek investment as soon as conditions begin to show a marked improvement. During the past few days the demand for securities has shown a decided increase. This indicates that discriminating investors have already begun to buy."

ELEVEN FUNDAMENTAL PRINCIPLES

Public Utility Bonds of This Country Proved Safe and Substantial by Economic Laws.

Public utility bonds of this country are established as safe and substantial investments by eleven fundamental principles contained in a booklet issued by P. W. Brooks & Company, of New York. The figures in the booklet were taken from an address delivered before the Finance Quorum at the West Side Y. M. C. A., New York, April 27, 1914. The eleven fundamental principles as established are those of demand, relation of supply and demand, efficient management, supervision by commission, analysis of condition, attitude of national banks, successful operation, tested by time, panic and war, free from competition, denominations of bonds and bond certificates, and yield proportionate with cost of living.

The principles are developed as follows: "Dependent upon population, public utilities companies have become absolute necessities for our large and ever-increasing population. It is an established fact that the volume of lighting and electric power business is in direct ratio to the population served. It is readily accepted that when the demand for an article is greater than the supply the price is not only sustained but increases until supply and demand have equalized. Every building that is built, whether for commercial or domestic purposes, means an increased demand for gas, electric light and trolley service. Efficiency and economy are best judged by results. The results of efficient management are best shown in the excellent annual reports of public utilities companies. When a company can pay 5 per cent to 6 per cent interest on its bonds and 7 per cent to 8 per cent on its stock, and lay by a surplus, efficiency and economy in management has certainly been established.

The introduction of public service commissions in almost every state also has done much to place all public service companies on a firm footing, inasmuch as under these com-

missions the companies are not heckled by petty local politicians or forced to pay interest to an organization under threat of competition. These commissions are a distinctive and added force of security for the investor in public utility bonds. The products of public utility companies, such as light, heat and power, go direct from manufacturer to consumer. Complete and comprehensible reports on the conditions of any company are, therefore, easily obtainable. The opinion of an expert is one of the most important factors in investing. For the past two years national banks have been increasing their holdings of public utility bonds, and decreasing what they have on hand of railroads and industrials.

Public utility companies have been successfully operated, as a whole, for the past thirty years. A careful compilation of figures for that time fixes this fact by a comparison of net earnings of railroads, industrials and public utilities. Net earnings in per cent of capital invested: Steam railroads, 4.25 per cent; industrials, 7.79 per cent; public utilities, 8.45 per cent. The above is a positive proof of successful operation. Let us take the worst side of the proposition and establish a negative proof. For the same period of time figures have been compiled showing the liability of companies to get into difficulties. This is called risk of receivership, and the following results have been deduced: Risk of receivership in per cent of capital invested, steam railroads, 1.84 per cent; industrials, 2.07 per cent; public utilities, 0.37 per cent. This shows that the liability of a steam railroad going into the hands of a receiver is five times as great as a public utility company. In a word, for the past thirty years public utility companies show net earnings of 8.45 per cent against 4.25 per cent for railroads, and the risk of receivership in railroads is five times greater. From 1907 to 1911, a period of panic, the following figures, showing a comparison of net earnings are even more emphatic: Per cent increase of net earnings 1907-1911, gas and electric, 60 per cent.; electric railway, 20 per cent; steam railway, 5 per cent. Steam railways show but 5 per cent increase in net earnings for 1907-1911, and in 1907-1908 their earnings decreased 20 per cent. Net earnings of industrials from 1907-1908 ran from 20 per cent increase down to 25 per cent decrease, a downward percentage of 45 per cent.

In any state which has a public service commission the utiliy companies have been given a practical monopoly in the district served. The reason for this is that the commissions have approximated the lowest cost of production and operating expense. This is an advantage enjoyed by no other class of privately owned enterprises. In no other class of security is there such a large proportion of bonds in denominations of $100 and $500, and many houses will issue certificates in any amount from $20 upward, yielding the same rate of interest as the bonds themselves.

This gives public utility bonds two important advantages over other securities: (1) They offer 5 per cent to 6 per cent to the investor on savings which have not yet reached the amount necessary to invest in other bonds. (2) They have a very broad, if not the broadest, direct distribution. This means that more people are interested in and affected by this class of security than any other. This is an excellent economic factor.

A great deal is heard these days about the high cost of living which means nothing more than that we have learned to want more, need more, and get more things. Fifty years ago 4 per cent was a sufficient rate of interest to meet the wants and needs of that day. We want to hold and increase our prosperity, and in public utility bonds is to be found the opportunity for accomplishing this purpose. They return an income of 5 per cent and 6 per cent, with a high degree of safety.

In conclusion, the business of public utility companies is not only an established necessity but is growing more than twice as fast as the railroad business. The railroads must extend and will, but the communities served by railroads will grow within themselves must faster than the railroads will extend. To meet the increase in demands of the public for public utility services it is estimated that $1,200,000,000 of new capital per year will be required, or $4,000,000 per working day. Now is the time, therefore, to invest in the securities of companies which are not only established but have begun an era of progress that will increase with the growth of the country."

EFFECT OF WAR ON EASTERN UTILITIES

Atlantic States Not Affected—Approximately the Same Rate of Growth Is Shown During August as Was Shown in July

The first month of the war saw very depressing conditions in this country, but these conditions have had little effect on the operations of the central stations of the Atlantic States. This will be noticed if a careful study is made of Table I. While the figures there are not strictly comparable, they will suffice for our purpose. The greatest lighting loads come in December, and from then on the load gradually diminishes until July, when the total daylight begins to decrease again. Thus August outputs ought to be greater than those for July, and by a glance at the 1913 column it is seen that the difference is not a great one. While the August figures are not in excess of the July figures by amounts so large as they would be under normal conditions, still the fact that they are greater shows that the effects of the war during the first month, in that region at least, were by no means injurious to the electric utilities. Only five companies showed output decreases during the month, three of which reported output decreases during July. One company which showed an output decrease in July showed a gain in August. While two of the companies reporting an output decrease for August were large companies, the actual decrease was very small. Only two companies reported a decrease in income. One of these supplied phosphate mines with its entire output.

TABLE I—RETURNS RECEIVED FROM CENTRAL STATIONS IN THE ATLANTI STATES OVER A SEVEN-MONTH PERIOD

	Income Derived from Sales of Energy			Energy Output in Kw-hr.		
	1914	1913	Per Cent Increase	1914	1913	Per Cent Increase
February (54 per cent of industry)	$7,288,792	$6,655,011	9.8	231,790,165	205,726,060	12.6
March (60 per cent of industry)	6,021,269	5,661,027	6.4	246,306,123	223,156,161	10.5
April (65 per cent of industry)	6,731,495	6,106,634	10.3	261,133,882	252,069,127	3.7
May (68 per cent of industry)	6,492,767	5,628,718	14.5	259,098,542	238,733,320	8.4
June (70 per cent of industry)	6,067,780	5,728,381	6.0	244,936,886	221,315,464	10.8
July (70 per cent of industry)	6,152,169	5,583,309	10.2	263,580,299	235,068,929	11.8
August (71 per cent of industry)	6,224,896	5,755,515	8.2	264,717,319	237,984,895	11.2

The figures in Table II are comparable figures over a seven-month period and show the operations of three large companies, one in New York, one in New Jersey and one in Pennsylvania. During the seven months the companies have by no means had an even growth. The average growth is closely approximated by the August figures, and while these figures for growth are not so good as the July figures, they are better than most of the other months.

Figures from over 60 per cent of the industry of the Middle Atlantic States showed the income for August, 1914, to have been $5,159,385 and for August, 1913, to have been $4,795,770, or an increase of 7.7 per cent. The output figures showed an increase of 8.3 per cent, from 182,357,792 kw-hr. to 197,608,176 kw-hr. Thus the conditions governing the industry were practically the same all over the Middle Atlantic States. The large companies showed practically the same rate of growth that the 60 per cent of the section showed. Returns from approximately 80 per cent of the industry of the South Atlantic States gave income figures for August of this year as $1,065,511 and for last year as $959,745, or an increase of 11.1 per cent. The output figures

increased from 55,627,103 kw-hr. in 1913 to 67,109,143 kw-hr. in 1914, or 20.6 per cent.

The returns for July and August have been broken up into companies of large, medium and small size. In this way the companies can be further compared during periods of peace and war. Seven large companies in July, 1914, had an energy-sale income of $4,175,462, against $3,807,435 in the previous year, or a 9.7 per cent growth. The same companies in August had a 7.5 per cent growth, from $3,840,052 to $4,128,374. The July figures from this group for output showed a growth of 9.7 per cent, from 161,623,852 kw-hr. to 177,330,634 kw-hr. In August the growth was 8.3 per cent, from 162,372,591 kw-hr. to 175,929,369 kw-hr.

The figures from the group of medium-sized companies were compiled from the returns from eighteen companies. The total income in July, 1914, was $1,275,379 and in the previous year was $1,153,263, or a growth of 10.7 per cent. In August the growth was 7.6 per cent, from $1,211,970 to $1,304,586. The output figures from the same companies in July showed a growth of 16 per cent, from 41,137,364 kw-hr. to 47,674,315 kw-hr., and 15.7 per cent growth in August, from 40,261,184 kw-hr. to 46,576,942 kw-hr.

TABLE II—COMPARATIVE FIGURES SHOWING THE MONTHLY OPERATIONS OVER A SEVEN-MONTH PERIOD OF THREE LARGE COMPANIES IN THE MIDDLE ATLANTIC STATES, REPRESENTING 35 PER CENT OF THE CENTRAL-STATION INDUSTRY OF NEW YORK, NEW JERSEY AND PENNSYLVANIA

	Income Derived from Sale of Energy			Energy Output in Kw-hr.		
	1914	1913	Per Cent Increase	1914	1913	Per Cent Increase
February	$3,766,823	$3,497,948	7.8	112,892,266	108,302,262	4.2
March	3,492,149	3,386,190	3.1	118,897,901	114,136,574	4.2
April	3,437,634	3,194,160	7.6	112,894,803	105,328,705	7.2
May	3,113,526	2,476,781	28.2	108,171,896	104,267,718	3.8
June	2,952,454	2,844,643	3.7	103,013,271	97,628,941	5.7
July	2,933,019	2,648,625	10.8	106,607,151	97,459,526	9.5
August	2,906,057	2,692,408	8.0	107,656,963	100,753,254	6.8

The third group contains seventeen small companies. The July figures from this group showed a 16.4 per cent increase in income, from $194,042 to $225,999, and the August figures showed an increase of 18.7 per cent, from $187,817 to $223,199. In July the output grew from 7,281,418 kw-hr. to 7,958,020 kw-hr., or 9.3 per cent. In August the output grew from 6,737,446 kw-hr. to 8,071,397 kw-hr., or 19 per cent.

The small companies were the only companies whose August growth surpassed the July growth. This was to be expected, especially at the beginning. The companies which one would expect to suffer at this time would be those supplying large industrial regions. In the large industrial centers a financial crisis is always a sufficient excuse for immediate curtailment. So much of the business depends upon loans and credit that any trouble in the money market necessarily means for them a retrenchment. The small electric utility companies depend more upon the lighting load for their income, and the industries which they supply are not always immediately affected by a sudden financial depression.

Business Notes

The Walpole Tire & Rubber Company, Walpole, Mass., has appointed I. W. Penniman Western sales manager, with headquarters in the Brooks Building, Chicago.

The Cadillac Electrical Manufacturing Company, of Cadillac, Mich., owing to expansion of business, has taken larger quarters in the Masonic Block. This company, which builds electric stoves and toasters, will be enabled to turn out 100 stoves a day in its new quarters.

The Independent Pneumatic Tool Company, of Chicago, Ill., has appointed V. W. Robinson in charge of Michigan territory with headquarters in Detroit. F. J. Passino, hitherto the company's representative in Michigan, has been chosen to represent the company in the Southwest, and he will succeed H. F. Finney, who has been transferred to the general sales offices of the company in Chicago.

The Indianapolis Engineering Company, with offices at 328 American Central Life Building, Indianapolis, Ind., has been organized by Messrs. R. M. Cass and E. Darrow, of that city, to do general work in the public-utility field. Among the company's present contracts are the appraisal of the properties of the Connersville (Ind.) Gas & Electric Company, appraisal work for the Oakland municipal plant, engineering for the new municipal plant at Tell City, Ind., rebuilding of the North Vernon Electric Light & Water Company, and engineering supervision for the French Lick and West Baden properties. The company also owns and manages the Brownstown Water & Light Company, which is now extending its lines to Medora and Vellonia, in Jackson County, Ind.

New Industrial Companies

The Sharfink Electric Manufacturing Corporation, of New York, N. Y., has been incorporated with a capital stock of $10,000 by M. F. Finkelstein, 740 Kelly Street, the Bronx; F. Schwartz, Brooklyn, and B. Kaplan, Astoria.

The Boulevard Light & Post Company, of Chicago, Ill., has been chartered with a capital stock of $2,500 to manufacture and deal in lamp-posts, etc., and to do general construction work. The incorporators are Robert J. Ralston, Joseph J. Rice and Daniel J. O'Connor.

The Van Har Electrical Company, of New York, N. Y., has been incorporated by C. B. Van Allen, 95 William Street; E. M. Harroun and T. J. Meehan, New York, N. Y. The company is capitalized at $50,000 and proposes to carry on a general electrical contracting business and to deal in electrical supplies.

Trade Publications

Electric Signs.—Various sign installations are illustrated in a catalog sent out by the Haller Consolidated Company, Chicago, Ill.

Varnish.—The Murphy Varnish Company, Newark, N. J., has issued a booklet describing a varnish which the company calls "univernish."

Automatic Sprinklers.—The General Fire Extinguisher Company, Providence, R. I., in its Bulletin No. 78 describes the Grinnell automatic sprinkler.

Insulating Materials.—The Canfield Rubber Company, Bridgeport, Conn., has issued a leaflet describing a friction tape and a rubber splicing compound.

Washing Machines.—Electric washers are illustrated in colors in an attractive catalog recently issued by the Grinnell Washing Machine Company, Grinnell, Ia.

Electric Mimeographs.—Motor-driven rotary mimeographs are described and illustrated in a bulletin published by the A. B. Dick Company, 730 West Jackson Boulevard, Chicago, Ill.

Fans.—Electric fans of the propeller type for ventilation purposes are described and illustrated in Bulletin No. 28 published by the L. J. Wing Manufacturing Company, 352 West Thirteenth Street, New York.

Controller for Air Compressors.—A folder describing an automatic controller which starts and stops a motor by variation of pressure of air, water or other fluid has been issued by the Leader Iron Works, Decatur, Ill.

Electric Appliance Shop.—A reprint of an article entitled "An Attractive Electric Appliance Shop," which appeared in the *Electrical World* of August 8, 1914, is being sent out by the Electric Appliance Shop, Springfield, Mass.

Tools.—Mathias Klein & Sons, 562 West Van Buren Street, Chicago, have issued a fall "trade stimulator" pointing out the need of stocking up to meet the demands of electricians, linemen, and central stations, which increase as the fall lighting season begins.

Personal Mention

Mr. Henry L. Doherty sailed for Europe on the steamship *Lusitania* on Oct. 14. He expected to be in London four days and to be in this country again about Nov. 1.

Mr. L. E. Marshall, formerly general superintendent of the Illinois Northern Utilities Company, Dixon, Ill., has been appointed manager of the Lexington (Mo.) properties of the Missouri Gas & Electric Company.

Mr. Frank Fuller has resigned as superintendent of the power department of the Albany-Southern Railroad Company, Hudson, N. Y., to take a similar position with the New York & Queens Electric Light Company.

Mr. E. Darrow, formerly manager of the Merchants' Heat & Light Company, Indianapolis, Ind., has with Mr. R. M. Cass formed the Indianapolis Engineering Company, engineers and operators of public utility plants.

Mr. A. S. Lowrie, who has for twenty-one years been chief engineer of the Montgomery (Ala.) Light & Water Power Company, has been made superintendent of the municipal water and electric plant at Dothan, Ala.

Mr. R. M. Cass, formerly electrical engineer for the Indianapolis (Ind.) Light & Heat Company, has with Mr. E. Darrow, of the same city, formed the Indianapolis Engineering Company for engineering, appraisal and operating work in the utility field.

Mr. Victor T. Noonan, secretary of the general safety committee of the Rochester (N. Y.) Railway & Light Company, has been appointed director of industrial and public safety for the State of Ohio. The position is a newly created one, and is directly under the Governor. Mr. Noonan, who is a former Rochester newspaper man, was appointed editor of the *Gas and Electric News* when that publication was started by the Rochester Railway & Light Company in 1911.

Mr. George B. Tripp was recently presented with a very elaborate sterling-silver coffee service by the members of the Harrisburg (Pa.) Chamber of Commerce in appreciation of his service to the city while he was acting as vice-president and general manager of the Harrisburg (Pa.) Light & Power Company. Mr. Tripp, while still acting as vice-president of that company, was transferred recently to New York City, where he is serving as operating executive of the United Gas & Electric Company.

Mr. Travis H. Whitney was entertained at dinner on Oct. 7 by members of the staff of the Public Service Commission of the First District of New York at the Martinique in honor of his seven years' service as secretary of the commission. The chair was taken by Mr. James Blaine Walker, assistant secretary. Among others present besides Mr. Whitney and Mr. Walker were Chairman McCall, Commissioners Maltbie and Williams, ex-Commissioners McCarroll and Eustis and Judge W. L. Ransom of the City Court.

Mr. Walter Howard Johnson, who was this week elected vice-president of the Electric Vehicle Association of America, is first vice-president of the Philadelphia Electric Company. Throughout his business career he has been identified with important phases of commercial life in Philadelphia and he was at one time connected with the Philadelphia, Wilmington & Baltimore Railroad, and later with the Pennsylvania Railroad. In 1887 he accepted a position with the Edison Electric Light Company of Philadelphia, with which company and its successors he has been connected ever since.

Mr. Angus S. Hibbard, formerly vice-president and general manager of the Chicago Telephone Company, has returned to Chicago as special representative of the American Telephone & Telegraph Company, after an absence of three years in New York City, where he acted as chairman of the latter company's committee on relations with the Western Union Telegraph Company. Mr. Hibbard was formerly active in the affairs of the A. I. E. E., of which he was both a vice-president and a member of the board of managers; the Electric Club of Chicago, and the Chicago Association of Commerce.

Mr. Russell Gould, who for the last two years has been superintendent of substations of the Northern Electric Railway, Chico, Cal., has been appointed superintendent of power with jurisdiction over the substations, overhead, third-rail and bonding. Mr. Gould was graduated in 1903 from a five-year course in civil and electrical engineering at the University of Georgia. He spent the next four years at the Schenectady works of the General Electric Company, being employed in the testing and drafting departments. For a year he was engaged in life-insurance work in Mexico and during the next four years was connected with the Texas Traction Company as electrical engineer on its Dallas-Sherman-Denison interurban line. This last position he resigned two years ago to become superintendent of substations with the Northern Electric Railway.

Mr. Walter H. Flandreau, who was elected president of the International Association of Municipal Electricians at its recent convention in Atlantic City, N. J., is city electrician of the city of Mount Vernon, N. Y. Mr. Flandreau was born Nov. 1, 1870, in the town of Greenburg, Westchester County, N. Y. He was educated in the public schools and learned telegraphy in the railroad office at Hartsdale, N. Y. At the age of eighteen he became a telegraph operator in the employ of the Commercial Cable Company and for seven years served as lineman and operator with the Postal Telegraph Company, opening up many new offices for that company. He was also prominently identified with the Telephone, Telegraph & Cable Company of America in its lifetime, in charge of plants at New Rochelle and Mount Vernon. Mr. Flandreau has been superintendent of fire alarms and city electrician of Mount Vernon for the past eighteen years and has been an active member of the International Association of Municipal Electricians for eight years.

WALTER H. FLANDREAU

Mr. Albert E. Peirce, formerly assistant general manager of the Chippewa Valley Railway, Light & Power Company, Eau Claire, Wis., has been elected vice-president of the Wisconsin-Minnesota Light & Power Company, formed to take over the properties of the Chippewa Valley Railway, Light & Power Company, the Chippewa Valley Construction Company and the La Crosse Gas & Electric Company. Mr. Peirce began his electrical career with the Brooklyn Heights Railroad in 1898, where he worked in the shops and the line department. He later served a year and a half in the testing department of the Westinghouse Company at East Pittsburgh, Pa. After a short experience with the Christensen Engineering Company, installing air brakes in the New England States, he went with Rossiter, McGovern & Company, New York, and for about two years installed apparatus in the East. Mr. Peirce became connected with the Pennsylvania Steel Company, Steelton, Pa., as electrical engineer of the bridge and construction and the frog and switch departments. In 1905 he resigned to take charge of the Indian Territory Traction at South McAlester, I. T., remaining during the reorganization of that company into the Choctaw Railway & Light Company. Later he entered the General Electric Company power and mining department in the Chicago office. Until the fall of 1907 he was stationed in Minneapolis, Minn. He became connected with the Chippewa Valley Railway, Light & Power Company at the commencement of its development work.

Obituary

M. J. Kenney, superintendent of the lighting department of the Little Rock Railway & Electric Company, Little Rock, Ark., is dead. Mr. Kenney was born in Elizabeth, N. J., and had resided in Little Rock for the last fourteen years, during which time he was continuously in the service of the Little Rock Railway & Electric Company. He is survived by a widow and a daughter.

Construction

New England

MILO, MAINE.—The Milo El. Lt. & Pwr. Co. expects to extend its transmission lines to the town of Sebec, a distance of about 6 miles, through a thickly settled farming district, to supply electricity to the farmers. The company has recently installed two 150-kw three-phase, General Electric generators, two 250-hp waterwheels and a new street-lighting system, using 80-cp nitrogen lamps. C. D. Towne is manager.

PHILLIPS, MAINE.—Within the next two months the Phillips El. Lt. & Pwr. Co. expects to purchase a 50-hp to 75-hp gas engine and to erect a small power house for lighting purposes within the next two weeks. H. H. Berry is manager.

RUMFORD, MAINE.—The Rumford Falls Pwr. Co., of Rumford, has recently purchased larger waterwheels to increase the output of the plant by 2000 hp; also additional steel poles and towers for extension to transmission line. Charles A. Mixer is engineer.

ATHOL, MASS.—The Athol Gas & El. Co. is contemplating extending its transmission lines to Petersham to supply electricity there. The town has already voted to light its streets with electricity. A. A. Laughton is manager.

SOUTHBRIDGE, MASS. — Preparations are being made by the Webster-Southbridge Gas & El. Co. for the installation of a new switchboard in its Southbridge plant, to cost about $4,000.

TURNERS FALLS, MASS.—Within the next two months the Franklin El. Lt. Co., Turners Falls, expect to purchase line material for rebuilding the system of the Montague El. Lt. & Pwr. Co., of Montague, which it expects to take over. W. H. Mahoney is superintendent of the Franklin company.

WORCESTER, MASS.—The contract for electrical work and electrical supplies for the new St. Joseph's Parochial School has been awarded to the Bancroft El. Co., 99 Pleasant Street, Worcester.

NEWPORT, R. I.—Bids will be received at the Bureau of Yards and Docks, Navy Department, Washington, D. C., until Oct. 31 for a complete street-lighting system at the naval hospital, Newport, R. I. Plans and specifications may be obtained on application to the bureau or to the commandant of the naval station, Narragansett Bay, Newport. H. R. Stanford is chief of bureau.

NEW HAVEN, CONN.—The capital stock of the United Illg. Co., of New Haven, has been increased by $500,000, the proceeds to be used for extensive improvements to the company's plant here.

Middle Atlantic

BERGEN, N. Y.—The Village Board is considering the proposal submitted by the Niagara, Lockport & Ontario Pwr. Co., of Buffalo, to furnish electricity to operate the municipal electric-lighting system. The proposition requires that the village shall furnish all equipment, consisting of an outdoor transformer station, to be situated on or adjacent to the company's line near the West Shore Railroad; transmission line and secondary transformers and meters. The proposed transmission line will be 6210 ft. over private right-of-way. A special election will be called to submit the proposal to the voters.

BUFFALO, N. Y.—Bids will be received by Franklin W. Ward, secretary state board of armory commissioners, 174 State Street, Albany, for construction, heating, plumbing and electric work for armory and stable at Buffalo, for Troop I, First Cavalry, National Guard, New York, until Oct. 30 (extension of date from Oct. 23). Copies of drawings and specifications may be obtained upon application to Lewis F. Pilcher, state architect, Capitol, Albany.

DUNKIRK, N. Y.—The Board of Water and Light Commissioners is contemplating replacing the carbon street lamps now in use with incandescent lamps.

LANCASTER, N. Y.—The Depew & Lancaster Lt. & Pwr. Co., of Lancaster, it is reported, contemplates extending its service to the towns of West Seneca, Elma, Marilla, East Hamburg, Wales, Clarence, Newstead and East Aurora. George R. Teller is president.

MAYVILLE, N. Y.—Bids will be received by the Board of Village Trustees of Mayville for $9,700 in bonds, the proceeds to be used for improvement and extensions to the municipal electric-light plant. W. H. Scofield is clerk of board.

NEWARK, N. Y.—The Municipal Board has entered into a contract with the Central New York Gas & El. Co. to light the streets of the village for a period of five years. Under this contract a new system has been adopted which provides for distributing the lamps in single units in place of the cluster lamps now in use; also for replacing the 60-cp lamps with lamps of 80 cp.

NEW YORK, N. Y—The Public Service Commission has awarded the contract for the construction of Section 1 of Route 48 to F. L. Cranford, for $1,571,363. This section is to be a two-track subway running from the extension of the Seventh Avenue subway in West Broadway under Park Place, the Federal Building and Beekman Street, to a point near William Street.

NIAGARA FALLS, N. Y.—The Buffalo & Niagara Falls El. Lt. Co. is reported to be contemplating the construction of a large substation and distribution plant on the line of the Erie Railroad, north of Perry Avenue, to cost about $60,000.

SYRACUSE, N. Y.—Bids will be received at the office of the supervising architect, Treasury Department, Washington, D. C., until Nov. 16, for a conduit and wiring system, lighting fixtures, heating repairs and extensions at the United States post office and court house in accordance with plans and specifications, copies of which may be obtained at the above office or at the office of the custodian at Syracuse.

WEST SAND LAKE, N. Y.—Preparations are being made by the Wynantskill Hydro-Electric Co., of West Sand Lake, for the erection of a new building near its present power station on the Troy & New England Railroad at Snyder's Lake. The company proposes to extend its service in West Sand Lake, Averill Park, Crooked Lake and surrounding territory. Clifford Hastings, of West Sand Lake, is president and general manager.

PHILADELPHIA, PA.—Bids will be received by the Department of Supplies, Room 312, City Hall, Philadelphia, until Nov. 2 for furnishing the Electrical Bureau with incandescent lamps and dynamotors.

PHOENIX, PA.—Application has been filed with the Public Service Commission by the Perkiomen El. Transit Co. for a certificate of public convenience which will give the company permission to do business in this State. The company is a Delaware corporation, capitalized at $25,000, and proposes to build a trackless trolley bus line along the public highway from Phoenixville to Emaus. The company, it is understood, has secured part of the franchises. James L. Wolcott, of Dover, Del., is president.

PITTSBURGH, PA.—Bids will be received at the office of the United States Engineer, Pittsburgh, until Nov. 21, 1914, for furnishing and installing two air compressors and one water turbine complete, with gear drive, at Lock No. 2, Monongahela River. For further information apply to Lt. Col. Francis R. Shunk.

PITTSBURGH, PA.—Bids will be received by George W. Gerwig, secretary board of public education of school district of Pittsburgh, 735 Fulton Building, Pittsburgh, until Nov. 3 for construction of the Schenley High School Building, to be erected in Grant Boulevard, Bellefield and Center Avenues (separate bids to be submitted), as follows: General contract, 1006; heating and ventilating, 1006-H; plumbing, 1006-P, and electric work, 1006-E. Plans and specifications may be obtained upon application to Edward Stotz, architect, Monongahela Bank Building, Pittsburgh.

WRIGHTSVILLE, PA.—C. H. Gilbert, superintendent of the Wrightsville El. Lt. Co., has asked the Council to grant the Edison El. Co. a franchise in Wrightsville in order to secure more energy for the town and for lighting the railroad bridge.

LAMBERTVILLE, N. J.—The property of the Lambertville Ht., Lt. & Pwr. Co. has been purchased by Robert C. Shields, of Philadelphia, Pa., at $30,500.

MORRISTOWN, N. J.—Bids will be received at the office of the supervising architect, Treasury Department, Washington, D. C., until Dec. 5, for construction, including mechanical equipment, interior lighting fixtures and approaches, of the United States post office at Morristown. Drawings and specifications may be obtained at the above office or from the custodian of site at Morristown. O. Wenderoth is supervising architect.

BALTIMORE, MD.—With a view of improving the lighting system of the Lexington Market City Comptroller Thrift has authorized surveys to be made of the building and stalls.

EMORY, VA.—Contract, it is reported, has been awarded by the trustees of Emory and Henry College for construction of power house to supply electricity for lighting all college buildings on campus.

WASHINGTON, D. C.—A scientific company in the East Indies has advised an American consular officer that it wishes to be placed in communication with American manufacturers of carbon in blocks, slabs and brushes, electrical brushes, primary batteries, etc.

WASHINGTON, D. C.—An American consular officer in South America reports that a firm in South America in his district expects to purchase equipment for a hydro-electric plant. Further information may be secured by addressing No. 14,008, Bureau of Foreign and Domestic Commerce, Department of Commerce, Washington, D. C., or branch office, Room 409, United States Custom House, New York, N. Y.

WASHINGTON, D. C.—A firm in the Far East reports to an American consular officer that it desires to purchase all kinds of electrical fixtures, especially lamps and bulbs. Catalogs and price lists should be sent. Further information may be obtained by addressing the Bureau of Foreign and Domestic Commerce, Department of Commerce, Washington, D. C., or branch office, Room 409, United States Custom House, New York, N. Y., referring to No. 13,997.

WASHINGTON, D. C.—An American consular officer in the Near East reports that specifications have been issued for the supply of material for and the installation of an electric-lighting system for a capital city in that country. Further information may be obtained by addressing No. 13,987, Bureau of Foreign and Domestic Commerce, Department of Commerce, Washington, D. C., or the branch office, Room 409, United States Custom House, New York.

WASHINGTON, D. C.—An American consular officer in Italy reports the name and address of a dealer who desires to receive offers from American manufacturers of metallic-filament electric lamps. Correspondence should be in French or English. Further information may be obtained by addressing No. 13,955, Bureau of Foreign and Domestic Commerce, Department of Commerce, Washington, D. C., or branch office, Room 409, United States Custom House, New York, N. Y.

WASHINGTON, D. C.—Bids will be received at the Bureau of Supplies and Accounts, Navy Department, Washington, D. C., until Oct. 27 for furnishing galvanometers, contactor, field rheostats, current transformer and generator set at the Naval Academy, Annapolis, Md. Applications for proposals should refer to Schedule 7400. Blank proposals will be furnished upon application to the navy pay office, Baltimore, Md. Samuel McGowan is paymaster-general of United States Navy.

WASHINGTON, D. C.—An English electrical company has notified an American consular officer that it would like to receive quotations from American manufacturers on 20 tons of electrodes for export. Dimensions, etc., of electrodes desired are indicated on a diagram which may be seen at the Bureau of Foreign and Domestic Commerce. The company asks that manufacturers submit a sample pair of carbons. For further information address No. 13.942, Bureau of Foreign and Domestic Commerce, Department of Commerce, Washington, D. C.

WASHINGTON, D. C.—A firm in southern Europe advises an American consular officer that it wishes to communicate with American manufacturers of metallic filaments for electric lamps. Prices and catalogs are required at once. Prices must be f.o.b. by any American port having direct connection with destination. Further information may be obtained by addressing No. 14,023, Bureau of Foreign and Domestic Commerce, Department of Commerce, Washington, D. C., or branch office, Room 409, United States Custom House, New York, N. Y.

WASHINGTON, D. C.—Bids will be received at the Bureau of Supplies and Accounts, Washington, D. C., until Oct. 27, for furnishing at various navy yards and naval stations supplies as follows: Schedule 7423—200 storage batteries, f.o.b. at works. Bids will also be received until Nov. 3 as follows: Brooklyn, N. Y., Schedule 7417—13,700 ft. of ¾-in. (I. P. S.) conduit steel; 1000 ¼-in. cap, Edison-base key sockets; Schedule 7420—two direct-current 250-volt, 4000-amp circuit breakers, 3100 ft. lead-covered, paper insulated, single-conductor cable, miscellaneous arc-lamp carbons, ten 4¾-in. by 19¾-in. Leyden jars, 2700 type F, lamp sockets, 5000 ft. 9000-circ. mil. twin-conductor wire, 10,000 ft. 4000-circ. mil. twin-conductor wire. Charleston, S. C., Schedule 7421 — miscellaneous seamless copper tubing. Portsmouth, N. H., Schedule 7421—1000 lb. seamless brass tubing. Boston, Mass., Schedule 7414—800 ft. flexible voice tubing (1-in. outside diameter, 50-ft. lengths); Schedule 7415—miscellaneous hard and soft copper wire and spring

brass wire. Norfolk, Va., Schedule 7417—carbons for Adams-Bagnall arc lamps (1500). Schedule 7420—miscellaneous truck and screened speed light controllers, to be delivered at Brooklyn, Boston, Philadelphia and Norfolk navy yards. Bids will be received at the same place until Nov. 10 as follows: Mare Island, Cal., Schedule 7433—108 2½-in. and 3-in. non-water-tight, 6-volt vibrating bells, 1200 type F sockets; Schedule 7434—4377 lb., not tinned, drawn seamless condenser tubes (Admiralty mixture 7 ft. 4 in. long). Puget Sound, Wash., Schedule 7433—five ¼-hp portable, ventilating sets. Bids will be received until Nov. 24 as follows: Pearl Harbor, Hawaii, Schedule 7413—miscellaneous stranded electric conductor, steel conduits and conduit fittings. Applications for proposals should give the schedule desired by number.

North Central

GRAND RAPIDS, MICH.—Initial steps have been taken toward the installation of an ornamental lighting system on Eighth Street, from Pere Marquette depot to Graham & Morton Wharf, and on River Avenue, from Seventh Street to Thirteenth Street.

HILLSDALE, MICH.—Within the next six months the Board of Public Works expects to purchase a carload of cedar poles; also to purchase a coal and ash-handling system within the next 12 months. J. C. Hauson is superintendent.

PONTIAC, MICH.—The City Commission has engaged Smith, Hinchman & Grylls, of Detroit, consulting engineers, to prepare plans and submit a proposal on four distinct methods of lighting the city.

ST. CLAIR, MICH.—The City Council is contemplating the installation of an ornamental street-lighting system on Riverside Avenue. The present plans provide for 21 Cutter boulevard standards, for five-lamp clusters, to be maintained by underground wires. W. M. Barron is superintendent of the municipal electric-light plant.

BARNESVILLE, OHIO.—The State Public Utilities Commission has granted the Sunnyside El. Co., of Wheeling, W. Va., permission to purchase the property of the Barnesville Gas & El. Lt. Co., at $70,000. The Sunnyside company was also given permission to purchase the system of the Belmont El. Co., of Bridgeport, for $5,000.

CLEVELAND, OHIO.—The Willard Storage Battery Co., of Cleveland, has obtained a permit to erect a power house at 280 East 131st Street. The building will be 49 ft. by 57 ft., of steel and concrete, and will cost about $5,000.

COLUMBUS, OHIO.—Bids will be received by G. A. Borden, director of public service, Columbus, until Oct. 28, for furnishing and installing complete lamp standards, conduit, cable and appurtenances on the Fourth Street Viaduct and approaches, in accordance with plans and specifications on file in the Department of Public Service, in custody of the chief engineer, where same may be seen and bidding blanks secured.

PEMBERVILLE, OHIO.—The Town Council has engaged F. H. Froelich, electrical engineer, Second National Bank Building, Toledo, to take charge of the installation of a municipal electric-light plant. The town has purchased the distributing system of Bushman Brothers, for $2,000.

FRANKLIN, KY.—The Franklin El. Lt. & Ice Co. expects to erect within the next two months a transmission line to Portland, Tenn., a distance of 12 miles. C. H. O'Brien, of Guthrie, Ky., is also interested in the movement. Within the next few months the Franklin company expects to purchase one 100-hp boiler. The company is now erecting a new cold-storage room that will hold 100 tons of ice and will purchase light hand-operated ice-handling machinery this fall. M. E. Johnson is general manager.

GRAYSON, KY.—J. A. Bagby, owner of the local electric-light plant, is considering the installation of an ice-manufacturing plant of about 5 tons capacity.

MAYSVILLE, KY.—Messrs. Rohen & Martin, it is reported, are having plans prepared by B. L. Baldwin & Co., of Cincinnati, Ohio, for the construction of a power house.

MIDDLESBORO, KY.—The Kentucky Utilities Co., of Lexington, is reported to be contemplating the erection of an electric transmission line over mountain to Middlesboro to connect Cumberland Gap, Tenn., with Varilla, Ky.

AKRON, IND.—The Akron Lt., Ht. & Pwr. Co. expects to erect a substation at once and to purchase equipment to transform energy delivered at 33,000 volts, three-phase, 25 cycles, for local distribution. Karl B. Gast is superintendent.

CRAWFORDSVILLE, IND.—Within the next six months the Board of Trustees expects to rebuild the arc-lamp lighting system, making it five circuits instead of four; also to purchase a new boiler-feed pump and a small air compressor. A 100-lamp Westinghouse rectifier has just been installed. F. H. Miller is superintendent.

AURORA, ILL.—The Western United Gas & El. Co., of Aurora, has petitioned the State Public Utilities Commission for authority to issue bonds to the amount of $30,000.

CHERRY, ILL.—Within the next 10 months the Spring Valley Utilities Co., of Cherry, expects to build a power house and to purchase one 700-kw, three-phase, 60-cycle, 2300-volt turbo-generator set; also to purchase within the next eight months material for 25 miles of 33,000-volt, three-phase transmission line. R. W. Brown is secretary.

CHICAGO, ILL.—The Lincoln Park Commissioners expect to purchase within the next 12 months 3000 400-cp, 15-amp type "C" lamps and 800 220-watt, 7.5 to 15-amp. compensators. Claude H. Shepherd is electrical engineer in charge.

CLINTON, ILL.—The Kise El. Co., of Peoria, has been awarded the contract for installing an electric-lighting system at the county farm, at $1,500.

HILLSDALE, ILL.—An electric generating unit, consisting of an Ames engine and a 200-kva Westinghouse generator (directly connected), is now being installed in the municipal electric-light plant. H. H. Bristol is superintendent.

NAUVOO, ILL.—Within the next 12 months the Nauvoo El. Lt. & Pwr. Co. expects to purchase electrical appliances and supplies, amounting to $1,000. Joseph Nelson is manager.

ROCK FALLS, ILL.—The Illinois Northern Utilities Co., of Dixon, has filed an application with the State Public Utilities Commission for permission to purchase the franchise and property of the Northwestern Barb Wire Co., in Rock Falls. The latter company asks permission to sell its franchise and property.

TOULON, ILL.—Within the next three months the Toulon Lt. & Pwr. Co. expects to purchase one 100-hp to 150-hp engine, one 200-hp heater and 50 meters. Miles C. Fuller is manager.

ZION CITY, ILL.—Plans are being considered for the installation of a new electric light and power plant in Zion City. The power plant on Twenty-seventh Street, it is understood, will be enlarged, and equipment added sufficient to supply electricity to all the Zion institutions, including Shiloh Tabernacle, Zion Home and Zion Stores. It is also proposed to use the exhaust steam at the plant for heating the institutions.

BANGOR, WIS.—The State Railroad Commission has authorized the Bangor Tel. Co. to issue $10,000 in bonds, the proceeds to be used for extensions and improvements.

SHAWANO, WIS.—The city of Shawano is contemplating the construction of a water-power plant to develop about 400 hp and the installation of an engine of about 30 hp. Paul E. Capraro is manager of the municipal electric plant.

TIGERTON, WIS.—The Tigerton El. Co., recently organized, is installing an electric-light plant. Power for operating the proposed system will be secured from the sawmill of the Tigerton Lumber Co. The equipment will include two generators. Other apparatus has not yet been decided upon. John Shannon is engineer in charge.

WEYAUWEGA, WIS.—The property of the Weyauwega El. Lt. Co. is said to have been purchased by Frank H. Josslyn and Le Roy Herrod, of Oshkosh. The new owners, it is understood, will rebuild the plant.

DULUTH, MINN.—Business men and property owners on Central Avenue are considering the question of installing an ornamental lighting system on Central Avenue, similar to the system established in the West End.

LAKE WILSON, MINN.—The town of Lake Wilson has voted to grant a ten-year franchise to install an electric-light system here. Plans are being considered for the erection of a transmission line from Pipestone to Hatfield, Trosky, Edgerton and Jasper, to furnish electricity to these towns from the Pipestone plant.

ST. PAUL, MINN.—Specifications for street-lighting have been approved by the City Council, which provide for furnishing energy only, the city to furnish and maintain the lamps. Under the specifications bids will be received for 700 arc lamps using direct current, 450 flaming-arc lamps using alternating current and 400 old-style carbon arc lamps. Bids are also asked on 435 nitrogen-filled lamps on the basis of a one-year contract, and on 835 nitrogen-filled lamps on a two-year contract. In addition bids are asked on 300 ornamental lamps on St. Clair Street, Summit Avenue and other portions of the city. These are to be nitrogen-filled lamps and bids will be taken on 80-cp, 100-cp and 250-cp lamps. The contracts will run for one year, 18 months and two years.

SPRINGFIELD, MINN.—The Ochs Brick & Tile Co., it is reported, will purchase electrical machinery and other equipment for its power plant now under construction.

WILLMAR, MINN.—The city of Willmar expects to purchase within the next seven months one 72-in. by 18-in. return boiler; also within the next six months one carload of cedar poles and washing machines as needed. N. W. Larson is superintendent.

CHARITON, IA.—The Union Company of Omaha, which recently purchased the municipal electric plant, will soon after the first of the year build a new generating station with an output of about 1000 kw. Willis Todd, First National Bank Building, Omaha, Neb., is secretary and manager.

KELLOGG, IA.—At an election held Oct. 7 the proposal to grant the Grinnell El. & Htg. Co., of Grinnell, a franchise to erect a transmission into the town was carried.

TARKIO, MO.—Within the next two months the Tarkio El. & Wtr. Co. expects to erect a transmission line to Westboro, a distance of 10 miles. W. F. Marshall is manager.

GRAND ISLAND, NEB.—Work will soon begin on the construction of a large hydro-electric power plant on the Loup River. Contracts have been awarded for the construction of a canal and a power house on the Loup River near Boelus, and a transmission line to Grand Island. About 3000 hp will be developed at a cost of about $300,000. The Grand Island El. Co. is interested in the project.

NELIGH, NEB.—The contract for street-lighting has been awarded to S. F. Gilman, owner of the local electric-light plant. Work will start immediately on the installation of the new system.

TEKAMAH, NEB.—Plans are being considered for the removal of the municipal electric-lighting and water plant. It is proposed to enlarge the plant and install new machinery.

CENTRALIA, KAN.—The city of Centralia is contemplating a 24-hour electrical service and may purchase a 60-hp engine and a 50-kw, three-phase alternating-current generator, switchboard panel, etc., in the near future. D. A. Steiner is superintendent.

CORNING, KAN.—An election will soon be held to submit to the voters the proposal to issue bonds for the erection of an electric transmission line and distributing system in the city. Energy for operating the system will probably be supplied from the municipal electric plant at Centralia. D. R. Steiner, superintendent of the Centralia municipal electric plant, is preparing plans for the system.

KANSAS CITY, KAN.—Bids will be received by C. W. Lovelace, purchasing agent, Kansas City, until Oct. 27 for furnishing and installing a turbo-generator set. Specifications are on file in the office of E. N. Stevens, consulting engineer, Scarritt Building, Kansas City, Mo.

TOPEKA, KAN.—Bids will be received by the Kansas Executive Council, Topeka, until Oct. 30, for electric wiring of the east and west wings of the State Capitol Building. Charles H. Chandler is state architect.

WELLINGTON, KAN.—The Department of Public Works expects within the next six months to erect a new power plant and 13 miles of 13,000-volt transmission line to supply electricity to operate the city pumping station; also to purchase complete new equipment for a turbine-driven plant, including boilers and transformers for a 200-kw, 13,000-volt line. N. E. Stone is superintendent of public works.

Southern States

ALLENDALE, S. C.—Bids will be received by the Commission of Public Work, Allendale, S. C., until Nov. 18 for construction of an electric-light plant and water-works system complete, as follows: Electric pole line distributing system, electric generating and pumping plant, equipped with two 100-hp boilers, feed-water pump and heater, steam engine, alternating-current generator and switchboard, two pumps and auxiliaries. Bids on two oil engines and two generators will be received as alternates for steam boiler and engine equipment. One 100,000-gal. or 75,000-gal. tower and tank, 13,500 ft. 8-in. and 6-in. cast-iron pipe with specials, 12,500 ft. 2-in. and 1½-in. wrought-iron pipe, 35 fire hydrants and 42 gate valves; one reinforced-concrete chimney or radial brick chimney, one reinforced-concrete reservoir

with concrete cover; 7 miles of sewer pipe from 8 in. to 15 in. in diameter, including disposal plant, etc. Plans and specifications may be seen at the office of the clerk and at the Savannah office of the Jaudon Engineering Co., where specifications may be obtained.

FLORENCE, S. C.—The Carolina Central El. Co., recently organized, has increased its capital stock from $500,000 to $800,000.

COLUMBUS, GA.—The Columbus Pwr. Co. expects to erect within the next 30 days a substation with an output of 600 kw to supply electricity in La Grange. A short branch from the present distribution line at La Grange will be erected to connect with the La Grange substation. Material has been purchased to erect two sectionalizing switch towers at La Grange and West Point. John S. Bleecker is manager.

MOULTRIE, GA.—The Water and Light Commission expects within the next three months to install one 450-hp Ball engine and 312 kva, 60-cycle, 2300-volt General Electric generator; also to purchase 94 ornamental standards, carrying five-lamp clusters, to be maintained by underground wires. J. M. George is superintendent.

ROCKMART, GA.—The Water and Light Department expects to install within the next three months one 200-hp, four-valve engine, one 125-kva generator (directly connected), with exciter, and one switchboard panel; also to purchase transformers and line material for city motor service. J. B. Cooper is superintendent of water and light department.

SAVANNAH, GA.—The Savannah Ltg. Co. is installing a 5000-hp General Electric turbine, induced-draft apparatus, transformers; erecting high-tension transmission line, and new substation and switchboards for main station and substations, at an approximate cost of about $150,000. S. O. Sauls is secretary and treasurer.

OCALA, FLA.—At an election to be held Oct. 28 the proposal to issue $75,000 in bonds for the purpose of constructing a new electric light plant in connection with the municipal water-works will be submitted to the voters. Plans for the proposed plant have been prepared by Twombly & Henney, engineers, 55 Liberty Street, New York, N. Y.

BIRMINGHAM, ALA.—The Board of Commissioners expects to erect within the next six months about 500 30-ft. and 35-ft. (7-in.-top) poles; and to purchase wire, series tungsten lamps, fixtures and transformer; also to purchase two generating units (directly connected) or a 500-kw turbo-generator set (alternating current). W. H. Abernathy is superintendent.

CENTERVILLE, ALA.—The Centerville Lt. & Pwr. Co. expects to erect within the next three months 5 miles of No. 6 bare copper wire; also to purchase 6 miles of No. 6 bare copper wire. O. C. Oakley is president.

OPELIKA, ALA.—The Carmack Ry. & Pwr. Co., it is reported, is planning to erect a power house at Lake Carmack. The company will begin work on the construction of its proposed railway from Opelika to Auburn, a distance of 7 miles, as soon as financial arrangements can be made. H. A. Bedell, of Opelika, is president.

SCOTTSBORO, ALA.—Plans are being considered by the City Council for lighting the streets of the city.

JACKSON, MISS.—The establishment of a municipal electric-light and power plant in Jackson, to cost about $200,000, is reported to be under consideration.

WEST MONROE, LA.—Plans are being considered by the City Council for the installation of a municipal electric-light and power plant.

BILLINGS, OKLA.—Bids will be received by the city of Billings until Oct. 29 for construction of an electric-light plant and water-works system, according to plans and specifications prepared by E. T. Archer & Co., engineers, New England Building, Kansas City, Mo. Copies of plans may be obtained upon deposit of $5 for each set. Bonds to the amount of $30,000 have been issued for the work.

EL RENO, OKLA.—Bids will be received at the office of the supervising architect, Treasury Department, Washington, D. C., until Nov. 24, for construction complete, including mechanical equipment, interior lighting fixtures and approaches, of the United States post office at El Reno. Drawings and specifications may be obtained at the above office or from the custodian of site at El Reno. O. Wenderoth is supervising architect.

YALE, OKLA.—The Council is contemplating submitting the proposal to issue bonds for the construction of an electric-light plant and extensions to the water-works system to the voters.

Pacific States

CATHLAMET, WASH.—Bonds to the amount of $4,200 have been voted for the installation of a municipal electric-light plant.

SEQUIM, WASH.—The City Council has granted J. L. Keeler a franchise to construct and operate an electric-lighting plant in Sequim. A committee has been appointed to make arrangements for street-lighting for the coming year. Work, it is understood, will be started at once on the proposed plant.

TACOMA, WASH.—The City Council has authorized B. W. Collins, superintendent of the municipal electric plant, to purchase incandescent lamps to the amount of $20,000, for which it is understood bids will soon be asked.

TACOMA, WASH.—The contract for building a 20-in. electric dredge, to be used in the Stuck River flood improvement project, was recently awarded to Tweeden & Marsh, of Tacoma, at $72,000, by the joint King and Pierce County Board of Commissioners.

MEDFORD, ORE.—The Medford Commercial Club has recommended to the City Council the installation of a municipal electric-light and power plant as a solution of the lighting and power question which the city is now involved in.

ANAHEIM, CAL.—The city of Anaheim expects to erect within the next three months 50 45-ft. poles and move street lines to alleys (about 1 mile) and to install 55 ornamental cast-iron lamp standards, carrying five-lamp clusters; also to purchase five 2½-kva transformers and 24 5-amp meters. E. H. Adams is superintendent.

AZUSA, CAL.—An election will be called in the near future to submit to the voters the proposal to issue $50,000 in bonds of which the proceeds of $20,000 are to be used for improvements and extensions to the municipal electric-light plant.

FRESNO, CAL.—Plans are being considered by Mayor Snow and the Board of Trustees for placing all electric wires in underground conduit in the business section of the city.

LODI, CAL.—Within the next 12 months the board of trustees may purchase 50 poles, 25 kw in transformers, 3000 lb. insulated weather-proof copper wire and incandescent Mazda lamps (costing about $1,200). John A. Henning is superintendent.

MARE ISLAND, (P. O. VALLEJO), CAL.—Bids will be received at the Bureau of Yards and Docks, Navy Department, Washington, D. C., until Nov. 21, for furnishing and installing a refrigerating plant complete, with all accessories, at the marine barracks reservation, United States Navy Yard, Mare Island. Plans and specifications may be obtained on application to the above bureau or to the commandant of the navy yard named. H. R. Stanford is chief of bureau.

STOCKTON, CAL.—The Western States Gas & El. Co., of Stockton, is planning to install a new street-lighting system in Stockton, and for a general reconstruction of its properties in Richmond and Eureka.

MESA, ARIZ.—The South Side Gas & El. Co., of Mesa, is erecting a substation of 250-kw rating. Westinghouse equipment will be used. H. L. Chandler is manager.

PRESCOTT, ARIZ.—Surveys have been completed by the Arizona Hydraulic Pwr. Co. for its proposed plant on the Upper Verde River. The present plans provide for development of about 12,000 hp with three different units, to cost about $1,700,000. The main transmission line will be about 80 miles long. Energy generated at the plant will be delivered at Globe and Miami. In addition a large tract of land will be irrigated by the flood waters after they have passed through the company's plants. E. H. Meek is president of the company.

MARYSVILLE, MONT.—New equipment, including a crusher, three Chile mills, contracting tables, etc., is now being installed at the Piegan-Gloster property of the Barnes-King Devel. Co. As soon as electricity is available an electrically operated pump will be installed for permanent drainage of the property. Energy will be supplied by the Montana Pwr. Co. from its Great Falls plant.

ERIE, COL.—Within the next two months the town of Erie expects to erect a new transmission line, to cost about $600. Frank Westwood is clerk and recorder.

GLENWOOD SPRINGS, COL.—The Mutual Lt., Ht. & Pwr. Co., of Glenwood Springs, expects to install a water-power system and to purchase two low-pressure turbine wheels, two generators, exciters, etc.

Canada

CHATHAM, ONT.—A by-law providing for an expenditure of $90,000 for the installation of the Hydro-Electric system was carried on Oct. 12. Preparations will be made at once for the erection of a substation and distribution system.

DUNDALK, ONT.—The Pine River Lt. & Pwr. Co., of Orangeville, has submitted a proposal to the town of Dundalk offering to supply energy to the amount of 200 hp at $40 per hp, the town to pay part of the cost of the transmission line.

PORT ARTHUR, ONT.—A by-law will be submitted to the ratepayers on Jan. 1, providing for an appropriation of $44,600 for the erection of a substation in Port Arthur.

ST. THOMAS, ONT.—The City Council is contemplating making changes in the street-lighting system, to cost about $13,141. It is proposed to erect on one street over 100 lamps of 875 cp. while on other streets the present lamps will be replaced by tungsten lamps of 100 cp. and 150 cp.

DAWSON, YUKON TER.—The City Council is considering the question of establishing a municipal electric-lighting plant and telephone system, at a cost of $165,000.

Mexico

QUERETARO, MEXICO.—Governor Federico Montes of the State of Queretaro, it is reported, is having plans prepared for the construction of an electric-railway system for the city of Queretaro and suburbs. A power plant will be built in connection with the project.

Miscellaneous

JUNEAU, ALASKA.—With a view of establishing a large calcium carbide and nitrate manufacturing plant, a group of prominent engineers have established headquarters in Juneau, where they are working out the details for the development of Speel River. A power plant, to develop 100,000 hp, is included in the project. The entire enterprise will involve an expenditure of about $10,000,000. E. P. Kennedy, formerly connected with the Treadwell mine, is at the head of the engineering corps; R. A. Kinzie, formerly general manager of the Treadwell mine, is also interested.

ILOILO, P. I.—Within the next six months the Iloilo El. Co. expects to erect about 10 miles of No. 6 B. & S. triple braid, weather-proof wire and to purchase a new 300-kw generating unit, including boiler. R. R. Landon is president and general manager.

New Incorporations

HARTSBURG, ILL.—The Orvil El. Lt. & Pwr. Co. has been organized by Daniel Van Gerpen, Clause Van Gerpen, J. H. Butler, D. J. Minch, E. R. Musgrove, Elmer Schmidt and A. C. Kief. The company proposes to supply electricity in Hartsburg and possibly in Emden.

FERDINAND, IND.—The Waterworks Co. has been incorporated with a capital stock of $21,000 by E. E. Schreifer, W. R. Sauer, J. A. Sinderman, and others. The company proposes to supply water, power, heat and light.

NEW YORK, N. Y.—The Diego de Avila Wtr. Sup. & El. Co. has filed articles of incorporation under the laws of the State of New York. The company is capitalized at $300,000 and purposes to construct and operate water-works and electric systems and cold-storage plants in Cuba. The incorporators are: Manuel P. Cadenas, of Camaguey, Cuba; F. R. Greene and W. J. Doyle, of Brooklyn, N. Y. Messrs. Reed & Pallister, Woolworth Building, New York, are attorneys.

LANCASTER, PA.—Charters have been filed for the East Earl El. Co. and the Caernarvon El. Co. in the office of the recorder of deeds. Each company is capitalized at $5,000 and their purpose is to supply electricity for lamps and motors in their respective townships. The directors are: W. W. Greist, R. B. Hull and J. S. Graybill, Jr.

BIG FALLS, WIS.—The Big Falls Lt. Co. has been organized with O. H. Tetzlaff as president and R. Konopatzka secretary.

ORFORDVILLE, WIS.—The Orfordville Lt. & Pwr. Co. has been chartered with a capital stock of $7,000 by A. E. Tomlin, W. E. Tomlin, of Evansville, and Charles Taylor, of Orfordville.

Weekly Record of Electrical Patents

UNITED STATES PATENTS ISSUED OCT. 13, 1914.

[Prepared by Robert Starr Allyn, 16 Exchange Place, New York, N. Y.]

1,113,187. SIGNALING DEVICE; W. A. Bischoff, St. Louis, Mo. App. filed May 12, 1913. Water-level indicator for refrigerator drip pans, etc.

1,113,199. ELECTRIC REGULATION; J. L. Creveling, New York, N. Y. App. filed Oct. 11, 1910. Charging storage batteries.

1,113,218. QUARTZ LAMP; F. G. Keyes, Boston, Mass. App. filed Feb. 10, 1913. Has a screen pervious to mercury vapor interposed between main body of anode and the rest of the container.

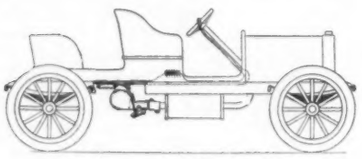
1,113,274. TELEPHONE TRUNKING SYSTEM; C. S. Winston, Chicago, Ill. App. filed Dec. 10, 1910. Protection of supervisory relays against discharge from the line conductors.

1,113,279. ALARM CLOCK; V. E. Adland, Chicago, Ill. App. filed Jan. 14, 1911. Hands of clock utilized to complete alarm circuits.

1,113,289. MOTOR CONTROLLER; T. E. Barnum, Milwaukee, Wis. App. filed Sept. 9, 1911. Maintains impressed voltage at a minimum until motor reaches half speed and then removes voltage-reducing means by sections.

1,113,312. TOY CAR; J. L. Cowen, New York, N. Y. App. filed May 31, 1913. Toy auto taking current through wheels from roadway and steered by a conductor rail.

1,113,319. LINE PROTECTIVE DEVICE; J. Erickson, Chicago, Ill. App. filed Feb. 14, 1912. Self-soldering heat coil.



1,113,673—Signaling Device

1,113,323. TREATMENT OF REFRACTORY ORES; J. Foye, H. E. Moore and R. Boyle, Johannesburg, Transvaal, South Africa. App. filed March 31, 1913. Subjects ores in solution of salts of an alkaline metal which is a non-solvent of gold to the passage of an electric current.

1,113,335. CIRCUIT-BREAKER; F. W. Harris, Wilkinsburg, Pa. App. filed Aug. 6, 1910. Calibration device by which circuit-breaker may be adjusted to interrupt circuit under predetermined conditions.

1,113,337. SAFETY-LIMIT STOP; L. C. Hart, Youngstown, Ohio. App. filed Jan. 10, 1913. For electric hoists.

1,113,348. STORAGE BATTERY; H. C. Hubbell, Newark, N. J. App. filed Dec. 7, 1909. For miner's lamps.

1,113,354. AUTOMATIC TRUNKING SYSTEM; A. E. Keith, Hinsdale, Ill. App. filed March 17, 1913. For giving subscribers various classes of service from same exchange.

1,113,376. ELECTRIC FURNACE FOR FIXING NITROGEN FROM THE AIR; E. K. Scott, Belvedere, England. App. filed June 25, 1913. Provided with a water-cooled roof forming a steam generator.

1,113,388. AUTOMATIC CONTROLLING DEVICE; J. H. Vander Veer, Brooklyn, N. Y. App. filed Oct. 15, 1910. Multiple-unit train control with a single train wire.

1,113,395. TELEPHONE SYSTEM; C. S. Winston, Chicago, Ill. App. filed Jan. 2, 1913. Interconnecting lines having magneto and battery circuits.

1,113,399. INSULATOR; L. B. Abbott, Bridgeport, Conn. App. filed June 12, 1911. Insulating link readily insertible in a pull chain.

1,113,429. SYSTEM OF CABLE WORKING; J. Gott, Hove, England. App. filed May 2, 1912. Each following signal appears on the opposite side of the central line of the recorder tape from the preceding signal.

1,113,433. CIRCUIT INTERRUPTER; F. W. Harris, Wilkinsburg, Pa. App. filed Oct. 8, 1910. Interconnecting mechanism for concurrently opening circuit interrupters and allowing independent closing thereof.

1,113,447. WRAPPING MACHINE; C. Kuentzel, Akron, Ohio. App. filed Aug. 6, 1913. For wrapping a tire or coil of wire.

1,113,460. ALARM SIGNALING APPARATUS; L. A. Meyers, Sauk Center, Minn., and O. H. Tracy, Plaza, N. D. App. filed Feb. 21, 1914. For ringing the telephone bells in a number of separated rooms.

1,113,487. ELECTRICALLY HEATED APPARATUS; E. E. Rose, Swissvale, Pa. App. filed Feb. 7, 1913. Bake oven.

1,113,492. TROLLEY-WIRE HANGER; W. Schaake, Pittsburgh, Pa. App. filed Nov. 24, 1911. Special mounting of trolley-clamping ear.

1,113,499. SOUND-MAGNIFYING APPLIANCE FOR TELEPHONIC AND TELEGRAPHIC PURPOSES; H. Smith, Magdeburg, Germany. App. filed April 18, 1914. Applicable to ordinary or telegraphone systems.

1,113,511. SYSTEM OF AUTOMATIC BLOCK SIGNALING FOR ELECTRIC RAILWAYS; F. Townsend (deceased), New York, N. Y. App. filed May 31, 1906. Sectionalized trackway with special inductance bonds.

1,113,519. PLUMB-LIGHT; D. A. Wallace, Chicago, Ill. App. filed April 21, 1913. Electric lamp combined with a plumb.

1,113,520. ELECTRIC-BOX CONNECTION; F. H. Ward, Brooklyn, N. Y. App. filed Nov. 2, 1910. For clamping end of spiral armored conduit to outlet box.

1,113,528. FUSE BLOCK; U. S. Anderson (deceased), Dallas, Tex. App. filed Sept. 8, 1913. For primary circuits; can be expeditiously installed without the use of tools.

1,113,537. TELEPHONE-LIGHTING SYSTEM; J. A. Boze, Waxahachie, Tex. App. filed April 4, 1913. Lamp on telephone is lighted when ringing and live circuits are closed.

1,113,546. ELECTROLYTE FOR USE IN ELECTROMETALLURGY; N. H. M. Dekker, Paris, France. App. filed Aug. 17, 1912. Embodies a salt of the metal to be refined.

1,113,559. METAL MOLDING; G. A. Jordan, New York, N. Y. App. filed Nov. 7, 1912. Special form of molding and capping.

1,113,560. METAL MOLDING; G. A. Jordan, New York, N. Y. App. filed Dec. 11, 1912. Has an inclosed wooden strip to which the capping is secured.

1,113,565. ASYNCHRONOUS MOTOR; T. L. Lee, Westfield, N. J. App. filed Nov. 9, 1912. Has a cup-shaped armature of thin copper.

1,113,592. SAFETY LIMIT SWITCH; R. I. Wright and H. F. Stratton, Cleveland, Ohio. App. filed Oct. 30, 1912. For stopping the hoist motion of an electric traveling crane.

1,113,593. SAFETY LIMIT STOP; R. I. Wright, Wickliffe-on-the-Lake, Ohio. App. filed Sept. 6, 1913. Connects the armature of the motor in a dynamic braking circuit, including the series field of the motor.

1,113,598. METHOD OF FIXING NITROGEN; J. E. Bucher, Coventry, R. I. App. filed Aug. 8, 1911. Produces ammonia.

1,113,599. METHOD OF FIXING NITROGEN; J. E. Bucher, Coventry, R. I. App. filed Aug. 8, 1911. Electrolytic production of a metal capable of combining with free nitrogen to form a nitride from a salt of such metal.

1,113,649. NON-INTERRUPTING EXTENSION OR PARTY-LINE TELEPHONE SYSTEM; L. Keller, Los-Angeles, Cal. App. filed June 16, 1908. Relay controls the ground connection that is common to the different telephones on the party line.

1,113,653. INCANDESCENT ELECTRIC LAMP; S. Klein, Vienna, Austria-Hungary. App. filed Dec. 16, 1913. Filament supported so as to form a letter.

1,113,657. VAPOR-ELECTRIC APPARATUS; O. O. Kruh, Czortkow, Austria-Hungary. App. filed April 12, 1905. Mercury-vapor rectifier.

1,113,673. SIGNALING DEVICE; D. G. McLean, Boston, Mass. App. filed July 2, 1912. Operated by exhaust from engine and controlled by push-button.

1,113,680. SAFETY THIRD-RAIL FOR ELECTRIC RAILWAYS; W. H. Parnell, Jr., Brooklyn, N. Y. App. filed May 6, 1907. Rail sections energized only when vehicle is adjacent thereto.

1,113,692. ARC LAMP; H. E. Ringe, Wyncote, Pa. App. filed March 6, 1911. For moving-picture machines.

1,113,718. MACHINE FOR WINDING INSULATED COILS AND THE LIKE; C. H. Thordarson, Chicago, Ill. App. filed Jan. 24, 1913. Winds alternate layers of wire and paper strip.

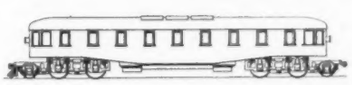
1,113,745. ELECTRIC GLOW-LAMP; F. Blau, Berlin, Germany. App. filed April 17, 1906. Suspenders for the filament are made exceedingly elastic.

1,113,760. STOVE; H. Dulz, Detroit, Mich. App. filed June 21, 1913. Gas automatically ignited and turned off by placing receptacle on or taking off stove.

1,113,762. MOUNT FOR ELECTRIC FITTINGS; G. A. Eckman, Chicago, Ill. App. filed Jan. 30, 1914. Provides adjustment for bringing switch fan flush with wall surface.

1,113,778. ELECTRIC FURNACE; J. H. Gray, New York, N. Y. App. filed Aug. 21, 1913. Arc type; for melting and refining metals.

1,113,817. CONTROLLER FOR AUTOMOBILE GAS LAMPS; A. M. O'Brien and W. D. Ferris, Sharon, Pa. App. filed Aug. 28, 1912. By which flow of gas lighting and extinguishment of lamps is controlled.



1,113,923—Electric Locomotive or the Like

1,113,819. ELECTRICAL COUPLING OF SIGNAL ARMS FOR RAILWAYS; A. Oesterreicher (deceased), Vienna, Austria-Hungary. App. filed Sept. 12, 1912. Connection between signal arm and the mechanical operating gear.

1,113,850. IGNITER MECHANISM; E. C. Wilcox and B. L. Lawton, Meriden, Conn. App. filed Jan. 16, 1914. Compact form of combined timer and distributer.

1,113,875. RAIL BOND; G. H. Burge, Huntsville, Mo. App. filed Oct. 9, 1912. Clamps bonding wire against sharp edge of the rail base.

1,113,901. MOTOR CONTROLLER; C. Jewell, Baltimore, Md. App. filed Aug. 24, 1912. Starter and reverser for alternating-current elevator motors.

1,113,909. PORTABLE ELECTRIC LAMP; A. C. Recker, Oakville, Conn. App. filed May 15, 1914. In simulation of a candlestick.

1,113,917. SHUNT REGULATOR FOR VARIABLE-SPEED MOTORS; J. G. Stirk, Halifax, Eng. App. filed Jan. 26, 1911. Uses two contact arms to the shunt resistance.

1,113,923. ELECTRIC LOCOMOTIVE OR THE LIKE; J. H. Ames, Chicago, Ill. App. filed July 18, 1913. Prime movers mounted in the space between the trucks and the generators mounted in the chambers of lesser headroom over the trucks.

1,113,937. TELEPHONE TESTING SYSTEM; E. A. Mellinger, Chicago, Ill. App. filed July 10, 1909. For automatic or semi-automatic systems.

13,806 (reissue). ELECTRIC ELEVATOR SYSTEM; E. M. Fraser, Yonkers, N. Y. App. filed April 28, 1914. (Original patent No. 1,093,583, April 14, 1914.) Traction type; two electric machines having co-operating rotors.